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THE MINERAL SECTOR IN INDONESIA

A country case study prepared by the UNCTAD secretariat under the project on the role of the mineral sector in the development process of developing countries (MINDEV)

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SUMMARY

i. The present study has been prepared under the project on the role of the mineral sector in the development process of developing countries (MINDEV). The background and objectives of this project are described in the Introduction. The project aims broadly to assist developing countries in the planning of mineral sector programmes. More specifically, it is intended to identify those policies or instruments which are most likely to enhance the contribution of the non-fuel mineral sector to economic development and promote a broader-based and eventually self-sustaining process of development. Work within the project is oriented towards the national level since this is the level where the problems addressed are directly experienced and the policies are ultimately implemented. This does not mean, however, that the issue of a supportive international environment can be neglected, and one objective of the project is to produce results which can assist in the creation of such an environment.

ii. Case studies on individual countries are being carried out with a view to describing in detail the experiences of these countries and identifying the particular problems encountered. The case studies attempt to take into account both the general economic environment and government policies pertaining exclusively to the mineral sector. Depending on the circumstances of a particular country, including the size of the mineral sector relative to the rest of the economy, the main concern from the point of view of policy formulation may be on maintaining macro-economic equilibrium, or on management of the sector itself. The present case study on Indonesia focuses particularly on the Indonesian system for handling foreign investment in the mineral sector. In this context, it attempts to identify the reasons underlying the considerable success experienced by Indonesia in attracting foreign investment and to assess the extent to which the objectives of the policies regarding foreign investment have been achieved.

iii. **Chapter I** reviews the general development of the Indonesian economy over the past decade. During this time, the Indonesian economy went through a major restructuring process. The restructuring - made necessary by the fall in oil export revenues - has drastically reduced dependence on oil exports and has resulted in a rapid diversification of the economy. The measures adopted can be grouped into two categories: austere macroeconomic policies intended to establish financial stability, including exchange rate depreciation and restrictive fiscal policies, and deregulatory reforms, including deregulation of financial markets, of investment decisions and of foreign trade.

iv. The Government's adjustment programme helped to reduce the current account deficit from 7.9 per cent of GNP in fiscal year 1982/83 to 2.3 per cent of GNP in 1991/92. In the initial phase of adjustment in the early 1980s, import restraints contributed most to the improvement in the balance of payments. In later years, the increase in non-oil exports was responsible for most of the changes. Non-oil/gas exports increased from 27 per cent of total exports in 1984 to 69 per cent in 1992. The public sector deficit and domestic inflation have also been reduced. The overall public sector deficit decreased from 4.9 per cent of GDP in 1982/83 to 3.4 per cent in 1988/89 and was turned into a surplus in 1990/91. The rate of inflation decreased from about 10 per cent in the early

1980s to between 5 and 6 per cent in the late 1980s and early 1990s. Total GDP increased at an average annual rate of 5.7 per cent from 1984 to 1991, while non oil/gas GDP increased at a rate of 6.7 per cent per year.

v. **Chapter II** provides a general overview of the mineral sector in Indonesia, including legislation and institutional arrangements. Tin, nickel, copper and bauxite are the most important minerals mined in the country. Aluminium is produced from imported alumina; steel is mainly produced from imported iron ore and scrap. Production of all metals and minerals increased rapidly in the 1980s and early 1990s. For the future, gold is the mineral product that is expected to show the fastest growth in terms of both production and exports. Exports are heavily concentrated on four products (copper concentrates, nickel matte, unwrought aluminium and unwrought tin) accounting together for about 80 per cent of the total export value. The regional market is of overwhelming importance, with two-thirds of exports going to Japan and 15 per cent to Singapore. The share of exports going to Japan has increased over time, while that of Western Europe has decreased. Raw materials for the iron and steel industry figure prominently in imports, with primary iron and steel, iron and steel waste and scrap, iron ore, pig iron, ferroalloys and direct reduced iron together accounting for almost 60 per cent of the import value (including semi-fabricated metal products). Imports are sourced widely, with a large and increasing proportion coming from developing countries outside the region, in particular Latin America.

vi. Mining's contribution to the GDP of Indonesia is relatively low, slightly above 1 per cent. This figure does not include all downstream activities, however, in particular the further processing of minerals mined in the country. Still, even with a very broad definition, the non-fuel mineral sector occupies only a modest place in the Indonesian economy in relative terms, although it is rapidly expanding both in volume and in diversity of products. Other indicators of the importance of the mineral sector give similar results. Employment in mining and quarrying, including oil, gas and coal, is around 400,000 persons or 0.7 per cent of the labour force. Most of this employment is in non-metallic minerals exploitation for local markets. Exports of non-fuel minerals and metals (excluding iron and steel) corresponded to 4.7 per cent of total exports in 1991. The proportion is unlikely to increase significantly in the future, given the rapid expansion of exports of manufactures and an expected increase in domestic consumption of metals and minerals. Total tax income from non-oil mining companies was around 200 million US dollars in 1989/90 and 1990/91, corresponding to about 1 per cent of total government revenue or 2 per cent of domestic non-oil revenues.

vii. An examination of linkages between the mineral sector and other sectors of the economy shows that the mineral sector in Indonesia has slightly less important backward linkages than is the case in developing countries with a longer history of mining and metals production. The Indonesian Government clearly sees the positive stimulus to regional development as one of the main benefits of mineral development activities. While the direct employment effects of mineral development may be small, the indirect effects, taking into account both increased demand for inputs from other sectors and the effects of a general increase in income, can be quite significant. In particular, even a relatively limited mining activity would provide a large addition of cash income to areas where the general economic activity is subsistence farming.

viii. **Chapter III** discusses the role of foreign investment in the development of Indonesia's mineral sector. It starts with a review of conditions in recent investment agreements and continues with discussions of the factors underlying the attractiveness of Indonesia to foreign investors and of the extent to which the Government has been able to realize the objectives of its policy regarding foreign investment. The foreign investor has to establish a joint venture company with one or more Indonesian partners. The joint venture company then applies to the Minister of Mines and Energy for a Contract of Work (COW). The COW signed between the Minister and the joint venture company has to be approved by the parliament and has the status of law.

ix. Conditions for foreign investment in the mineral sector in Indonesia have been favourable compared to the situation in most developing countries, as evidenced by the considerable interest shown by international investors. Particularly attractive from the foreign investor's point of view has been the immunity of COWs to subsequent changes in legislation and the fact that since the COWs are adopted by parliament, they clearly supersede other government regulations. It is clear from discussions with investors that the stability of conditions, more than the conditions themselves, is what has created the perception of Indonesia as having a good investment climate.

x. As regards the financial conditions for foreign investment, comparisons with other developing countries show that regulations concerning taxation in Indonesia are relatively favourable, although not more so than in other countries that have succeeded in attracting significant foreign investment in mining. The same applies to regulations concerning repatriation of profits, imports of equipment and other regulations pertaining to financial conditions. The only disadvantage from the investor's point of view is the requirement for a phased divestment of shares in favour of domestic investors, which has the effect of reducing the degree of control that the foreign investor can exercise.

xi. A positive investment climate for the mineral sector is not, however, simply a function of financial conditions. A geology considered to be favourable to the occurrence of large and high grade mineral deposits is obviously a necessary requirement. Indonesia is clearly believed to have favourable geological conditions. It constitutes an additional advantage if the government is able to facilitate exploration by providing basic geological information in the form of geological maps, geophysical and geochemical data, and information about the results of earlier exploration. Recent budget cuts in the agencies concerned with the provision of basic geological information have left these agencies in a situation where they depend largely on external assistance in order to carry out field work. On the other hand, the Government is making efforts to ensure that data are widely available.

xii. The speed and clarity of legal and administrative procedures are also important components of the investment climate. This includes aspects such as the time needed to obtain permits, whether procedures are clear and appropriate and whether they remain stable. The division of authority between the central and provincial governments has in a number of cases led to authorizations overlapping each other. Conflicts resulting from this have generally proved easy to settle, and the basic mining law provides consistent guidance on this point. The aforementioned budget cuts have, however, of necessity affected the level of service provided by the Government as well as the degree of control

exercised by it. The time needed to obtain authorizations has increased, reporting requirements are enforced less rigorously than in the past, and the frequency of mine inspection visits has decreased. In order to retain investor confidence, it is important to ensure that applications be dealt with speedily. The Government is taking steps in this direction, *inter alia*, through the computerization of registers of mining rights.

xiii. A final area where clarity of regulations and government support to the industry is important is environmental protection. COWs approved in more recent years contain provisions for environmental impact assessments. One problem is the lack of established standards as regards emissions from mining and metallurgical activities and the variations in practice between different parts of the country. Another problem is the lack of experience by government authorities in evaluating assessments.

xiv. As regards the future direction of Indonesian policy towards foreign investment, it would appear that the case for special conditions for foreign investors is growing weaker as the economy develops and as the domestic companies mature. The success of other export industries and the easing of the external debt situation may also in the long term have the effect of reducing the premium on export income generated by the mining industry. It might then not be as necessary to rely on foreign companies to carry out mineral development projects. It seems clear, however, that it will take a long time before private domestic companies acquire the necessary financial strength and know-how to finance and implement major investment projects. Meanwhile, it would seem likely that some concessions will be given to foreign investors in order to ensure the development of large deposits.

xv. Two important government objectives which have played a role in policy formulation as regards foreign investment in mining are the maximization of export revenue and of government income. It is probably correct to state that maximization of export income is the Government's primary objective with regard to the non-fuel mineral sector. The sector's contribution in this regard has been important. It has contributed to the largely successful restructuring of the external debt in a period when income from the major source of export proceeds, the oil and gas sector, was falling. The main instrument used to achieve this was the promotion of foreign investment through the use of COWs. While state-owned companies also play an important role in this context, the provision of capital and technology by foreign companies has been crucial. The attractiveness of this method from the Government's point of view is that the capital brought in by foreign mining companies is additional and does not deprive other sectors of investment funds. Furthermore, in a country such as Indonesia, which lacks a long history of most types of mining, technology will generally have to be brought in through foreign investment. The objective of maximizing government income from the non-fuel mineral sector appears to have had lower priority in Indonesia than in many other developing countries, probably because of the limited potential of this sector compared to other sources of public sector income.

xvi. Other objectives have clearly also been important to the formulation of policy with regard to foreign investment. In 1990, the Director General for Mines identified the following four primary outcomes expected from foreign companies engaged in the mineral sector: regional development, manpower development and transfer of know-how,

promotion of local content and promotion of value added.

xvii. The emphasis on regional development has yielded results in terms of exploration activity concentrated on the less developed parts of the country. It is more difficult to estimate the impact of major mining projects on regional and local economies. Results vary from region to region.

xviii. As regards manpower development and transfer of know-how, the COWs require foreign investors to maximize the employment of Indonesians within the limits of practicality and efficiency. The proportion of Indonesians employed is generally very high and has increased for all categories of employees except at the level of management. The decrease in the share of Indonesians at the management level can probably be attributed to the large number of new COWs in the late 1980s. Work under most of these COWs has not progressed beyond the exploration stage.

xix. It is not certain whether the attempts to encourage purchases of inputs on the domestic market have had any major effect, since companies have been allowed to resort to imports whenever domestic products were unavailable on competitive terms. As the Indonesian manufacturing sector becomes more diversified and as the liberalization of trade policy continues, it becomes ever more likely that Indonesian products can be supplied on competitive terms.

xx. The Government is also determined to increase the degree of processing in the mineral sector. The domestic market for processed minerals and metals is growing as a result of the increase in production of manufactured goods, and the proportion of processed minerals and metals production sold domestically is on an upward trend. It is worth noting that whereas semi-fabricates production has mostly been established without any direct intervention by the Government, expansion of processing capacity at earlier stages, as in the cases of copper and of alumina/aluminium, requires large amounts of capital and it is therefore necessary for the Government to engage itself in the decision-making and investment process. The particular provisions concerning downstream processing in the COWs are unlikely to have been of major importance in this regard, although they serve as an expression of the Government's objectives.

xxi. **Chapter IV** discusses some other mineral sector policies and problems, in particular the role of the domestic private sector companies and small-scale mining. Domestic mining companies, with the exception of the state-owned ones, are still small. These companies are often family-owned firms which have acquired their financial stake in other businesses and have diversified into mining. Conditions for investment by domestic companies are significantly less attractive than those for foreign investors. Given the high real interest rates and an abundance of business opportunities resulting from deregulation, private mining companies find it difficult to raise the funds needed for development of deposits and for investments in processing. Although there is no information implying that the rate of return on capital in the mineral sector is lower than in other sectors, the high risks involved make it difficult to obtain funds from the banking system. It is probable that as the banking system and the private capital market develop, finance for investment by domestic mining companies will become easier to obtain. Nevertheless, finance for investment in the mineral sector everywhere in the world comes

from either international banks, which consider only very large projects, or from funds generated within the companies themselves. Thus, the private Indonesian companies will themselves have to generate a large portion of the investment funds needed.

xxii. The Government is clearly aware of the potential importance of small-scale mining to local and regional economic development, and a number of measures have been introduced to improve the conditions under which small scale miners operate. Provisions for small-scale mining or "People's Mining" are included in the basic mining law. These provisions are fairly restrictive, however, accordingly, a new scheme for small-scale mining, called PSK after its Indonesian initials (Pertambangan Skala Kecil), was introduced in 1990. Organizationally, PSK is linked to the village cooperative units known as KUD (Koperasi Unit Desa). Under the PSK scheme, the KUDs are granted an Exploitation Mining Authorization which cannot exceed 100 hectares in area. They receive technical assistance from the relevant government departments as well as from state-owned companies and from COW holders. They are also given financial assistance from state-owned companies. The financial assistance can be used to purchase equipment or as collateral for loans.

xxiii. One of the reasons for introducing the PSK concept was the need to avoid conflicts over mining rights and conflicts between local populations and artisanal gold miners, such as had occurred in Kalimantan. This is one of the areas where the new scheme appears to have worked. It may yet be too early to attempt an evaluation of the PSK scheme, and the scheme has encountered considerable difficulties in implementation, principally due to the lack of qualified management. Nevertheless, some interesting features of the scheme should be noted. These include the integration of small scale mining operations into an existing economic framework, the provision for technical extension services, and the overall coordinating roles of the Department of Mines and Energy and the Department for Cooperatives. All of these features would seem to be necessary to ensure success of the scheme. Technical extension services, in particular, are likely to be crucial in light of the limited technical and managerial capabilities of most of the small-scale mining ventures.

INTRODUCTION

1. The present study has been prepared under the project on the role of the mineral sector in the development process of developing countries (MINDEV). This project, which was initiated by the UNCTAD secretariat in 1988, aims broadly to assist developing countries in the planning of mineral sector programmes. More specifically, it is intended to identify those policies or instruments which are most likely to enhance the contribution of the non-fuel mineral sector to economic development and promote a broader-based and eventually self-sustaining process of development.

2. The rationale for the project stems from the fact that for most developing countries the exploitation of their natural resources, together with trade in the primary products derived therefrom, continues to provide the main basis for their economic growth. Even for developing countries that do not at present have any significant mineral sector activity within their territories, as is the case for many of the least developed countries, development of mineral resources provides one of the few feasible ways of promoting economic growth. This resource-based process of growth is often perceived as an export-oriented activity whereby primary commodities are exchanged by developing countries for the capital required to expand, diversify and eventually industrialize their economies. The development process is also affected, however, by the nature and extent of the feedback between the exploitation of a country's natural resources and other sectors of the domestic economy. The more extensive this feedback, the greater is likely to be the value of resource-based development for the country concerned.

3. This issue is especially relevant to the exploitation of non-renewable resources, since feedback will necessarily cease as the resources are exhausted. At that time, the capital represented by the original mineral deposit should have been replaced by other forms of capital capable of yielding the same return. Mineral sector policy in many developing countries is directed towards maximizing foreign exchange income; moreover, a high level of debt service payments, which is typical of many mineral producing developing countries, often dictates that foreign exchange earnings be given a high priority. The high priority given to maximization of foreign exchange earnings may to some extent be in conflict with a government's objective of securing as large a share as possible of the rent generated by mineral exploitation. Traditionally, governments of countries with large mineral sectors have sought to maximize their share of the rent in order to finance investment in sectors considered to be critical to long-term economic growth, such as infrastructure and sectors with strong production and consumption linkages, it being recognized that the mineral sector in itself often provides limited opportunities for the development of such linkages. This strategy raises problems of economic policy which have been dealt with extensively in economic literature [1]. These problems include:

The taxation problem, that is, how to maximize the government's share of the mineral rent without introducing distortions leading to a less than optimal extraction rate and without dissuading investment;

The macro-economic problem, or how to combine variations in income from

mineral exploitation with macro-economic equilibrium;

The absorption problem, which consists of distributing the mineral income to other sectors, and which includes the choice of whether to increase investment or consumption.

4. The debate concerning "Dutch disease" [2] has focused on the last two problems. However, the Dutch disease theory, at least as originally formulated, deals mainly with the problems that arise when a country experiences a sudden increase in foreign exchange income, usually from oil or mineral exports. From the perspective of developments during the 1980s and 1990s, the reverse situation, that is, a sudden fall in foreign exchange earnings, is more relevant for many countries. This raises problems of structural adjustment that are just as serious as the problems associated with a boom, if not more so. The same conceptual framework can however be applied to both cases, and it may be a truism to state that countries which have managed well the upturn in export income are usually better prepared to deal with the consequences of the downturn.

5. The MINDEV project takes into account the three problems mentioned, as well as the associated problems of structural adjustment following a fall in mineral revenues. Another original aim of the project was to identify ways by which a government can, through micro-economic reform and regulatory measures, strengthen the weak production/consumption linkages between the mineral sector and the rest of the economy, thus avoiding a situation where the mineral sector operates in isolation from the rest of the economy. Subsequently, however, this objective has been given lower priority since, for most mineral-dependent economies in recent years, the problems of macroeconomic management became more acute and since it appears increasingly clear that little in the way of positive results can be expected from microeconomic reform unless macroeconomic balance had been achieved. [3] This does not mean that linkages are unimportant, particularly if all linkages are taken into account. The flow of labour income, profits and foreign exchange which can be recycled into the economy may have a large impact in a situation of underemployment or foreign exchange constraints. [4] However, in the absence of macroeconomic stability, it is unlikely that these positive linkage effects will materialize. Accordingly, while attention is given within the MINDEV project to the desirability of developing and strengthening linkages, other aspects of economic policy in mineral-dependent developing countries, including problems of macroeconomic management, have been given more weight.

6. Work within the project is oriented towards the national level since it is at that level that the problems addressed are directly experienced and the policies are ultimately implemented. This does not mean, however, that the issue of a supportive international environment can be neglected: one objective of the project is to produce results which can assist in the creation of such an environment.

7. A number of case studies on individual countries are being carried out with a view to describing in detail the experiences of these countries and identifying the particular problems encountered. The case studies attempt to take into account both the general economic environment and government policies pertaining exclusively to the mineral sector. Depending on the circumstances of a particular country, including the size of the

mineral sector relative to the rest of the economy, the main concern from the point of view of policy formulation may be maintaining macroeconomic equilibrium, or management of the sector itself. Within the group of countries studied - Chile, the Dominican Republic, Indonesia, Morocco, Peru, Sri Lanka and Zimbabwe are countries illustrating both sets of concerns. The case studies are intended to throw light on preliminary conclusions generated by the general analytical work carried out within the project, and to provide illustrations of general trends and phenomena observed and data to be used in the preparation of the final conclusions of the project.

8. The present case study on Indonesia focuses particularly on the Indonesian system for handling foreign investment in the mineral sector. In this context, it attempts to identify the reasons underlying the considerable success experienced by Indonesia in attracting foreign investment and to assess the extent to which the objectives of the policies regarding foreign investment have been achieved. It also describes the efforts made by the Indonesian Government to ensure that mineral production activities have a positive impact on local and regional development. These aspects may be relevant to the ongoing debate on approaches to mineral sector planning and management and may be of interest to other countries facing similar situations with regard to the development of their mineral resources.

9. Some of the information for the present study was collected during two missions, in May/June 1990 and in February 1991. A list of persons interviewed appears as an annex to this report.

Notes

1. See, for instance, A. Gelb *et. al.*: Oil Windfalls: Blessing or Curse, Oxford, 1988, and S. R. Lewis: Development Problems of the Mineral-Rich Countries, in Syrquin, Taylor, Westphal (eds): Economic Structure and Performance: Essays in Honour of Hollis B. Chenery, San Diego Academic Press, 1984.

2. The term "Dutch disease" refers to the boom-induced rise in the real exchange rate and the associated relative decline of non-mineral traded goods industries. It originally described the effects on the Netherlands economy of the offshore gas discoveries in the 1960s.

3. A study on mineral dependent developing countries recently prepared for the UNCTAD secretariat found that the direct and quantifiable effects of trade and industrial policy on economic growth were dominated by macroeconomic variables, in particular the variability in the real exchange rate (R. Auty, D. Evans: Trade and Industrial Policy for Sustainable Resource-Based Development: Policy Issues, Achievements and Prospects. (UNCTAD/COM/33), Geneva, December 1993.

4. For instance, a study by M. Lasaga on Chile showed that an increase in copper production of 10 per cent led to increased copper sector employment by 2 400 persons, or 0.1 per cent of the total labour force, but had only a small direct impact on output of other industries. However, when indirect macro effects were taken into account, the sustained increase in copper production caused an economy-wide increment of about 50 000 employees, or 1.9 per cent of the labour force. (M. Lasaga: *The Copper Industry in the Chilean Economy: An Econometric Analysis*. Lexington 1981, Heath Lexington Books. Quoted in F. Gerard Adams and Jere R. Behrman: The Linkage Effects of Raw Material Processing on Economic Development: a Survey of Modeling and Other Approaches. *Journal of Policy Modeling*, vol. 3, No. 3, October 1981, North Holland, New York.)

I. THE INDONESIAN ECONOMY

A. General economic development[1]

10. Over the past decade, the Indonesian economy has gone through a major restructuring process. This process, which was made necessary by the fall in oil export revenues, has reduced the dependence on oil exports drastically and has resulted in a rapid diversification of the economy.

11. Faced in the early 1980s with falling oil prices and, since 1985, with adverse effects of international currency fluctuations on debt service payments, the Indonesian Government responded by undertaking adjustment measures and structural policy reforms. The measures adopted can be grouped into two categories: austere macroeconomic policies intended to establish financial stability, including exchange rate depreciation and restrictive fiscal policies, and deregulatory reforms, including deregulation of financial markets, investment decisions and foreign trade.

12. The Government's adjustment programme helped to bring down the current account deficit from 7.9 per cent of GNP in fiscal year 1982/83 to 2.5 per cent of GNP in 1988/89. It has stayed at roughly the same level since then, and was 2.3 per cent of GNP in 1991/92. In the initial phase of adjustment in the early 1980s, import restraints contributed most to the improvement in the balance of payments. In later years, the increase in non-oil exports was responsible for most of the changes. Non-oil/gas exports increased from 27 per cent of total exports in 1984 to 69 per cent in 1992. In addition to exchange rate depreciation, the measures that helped restore balance-of-payments stability included rephasing of, and cutbacks in, large capital spending projects, redefinition of public sector expenditure priorities, which diverted expenditures away from relatively import-intensive sectors, imposition of limits on non-concessional external borrowing, austere monetary and fiscal policies and trade and other regulatory reforms.

13. The public sector deficit and domestic inflation were also reduced. The overall public sector deficit decreased from 4.9 per cent of GDP in 1982/83 to 3.4 per cent in 1988/89. In 1990/91 the deficit was turned into a surplus. The rate of inflation decreased from about 10 per cent in the early 1980s to between 5 and 6 per cent in the late 1980s and early 1990s.

14. Total GDP increased at an average annual rate of 5.7 per cent from 1984 to 1991, while non oil/gas GDP increased at a rate of 6.7 per cent per year. Table 1 shows how the distribution of GDP has changed from 1981 to 1991. The deterioration in the terms of trade resulting from falls in oil prices had an adverse effect on domestic incomes during the first half of the 1980s. This necessitated cutbacks in public investment and led to a fall in private investment and slower growth in private consumption. The structural reforms undertaken in the second half of the decade led to a recovery of the non-oil economy and resumed growth in private investment. Table 2 shows changes in the composition of expenditure on GDP from 1981 to 1991.

Table 1. Distribution of GDP at constant 1983 market prices (per cent)

Sector	1981	1985	1991
Agriculture, forestry, fishery	24.1	22.7	18.5
Crude oil and gas	22.0	17.1	14.2
Mining	0.8	1.1	1.4
Petroleum refining, liquid natural gas	2.6	4.3	4.5
Manufacturing	8.4	11.5	15.4
Electricity, gas and water	0.5	0.4	0.7
Construction	6.1	5.3	6.0
Trade, hotels, restaurants	15.3	14.6	15.9
Transport and communication	4.6	5.3	5.6
Banking and financial services	2.7	3.5	4.5
Ownership of dwellings	2.5	2.9	2.5
Public administration and defence	6.5	7.6	7.4
Other services	3.9	3.7	3.4
Total	100.0	100.0	

Sources: Indonesia: Strategy for Growth and Structural Change. World Bank Report No. 7758-IND, Washington, D.C., 3 May 1989 (figures for 1981); Biro Pusat Statistik: Monthly Statistical Bulletin, April 1993 (figures for 1985 and 1991).

15. The adjustment process did involve social costs, mainly in terms of stagnating or declining real labour earnings. However, the trend has now been reversed and real earnings are increasing again.

16. The objective for the future, as set out in the fifth five-year development plan (Repelita V) which started in fiscal year 1989/90, is to achieve a balanced economic structure, with emphasis on the agricultural sector for consolidating food self-sufficiency and promoting product diversity, and on the industrial sector for promoting industries that export, absorb substantial manpower, process agricultural products and produce industrial machinery. One of the main objectives is to deal with the problem of providing adequate productive employment opportunities for the rapidly growing labour force. Some 11.9 million new job seekers will enter the labour market over the period covered by the plan. In addition, an important portion of the labour force is currently underemployed or unproductively employed.

17. Table 3 shows the financing of development expenditure from 1984/85 to 1990/91 and the proportion of expenditure that has gone to industry, mining and energy. The

table illustrates how industry and mining were relatively de-emphasized in later years.

Table 2. Composition of expenditure on GDP at constant 1983 prices (per cent)

	1981	1985	1991
Consumption	66.0	71.2	64.3
Private consumption	55.4	60.0	54.4
Government consumption	10.5	11.2	9.9
Gross domestic fixed capital formation	24.7	20.9	28.6
Change in stocks	7.2	5.5	-0.5
Exports of goods and non-factor services	30.0	23.6	29.2
Imports of goods and non-factor services	-27.8	-21.2	-21.5
Gross domestic product	100.0	100.0	100.1

Sources: See table 1

Table 3. Development expenditure, financing and share of industry, energy and mining sectors, fiscal years 1984/85 to 1990/91

Fiscal year	Total development expenditure, billion rupiah	Public savings, per cent	External aid, per cent	Industry, per cent	Energy, per cent	Mining, per cent
1984/85	9954.5	65.1	34.9	6.1	9.2	2.4
1985/86	10873.9	67.1	32.9	8.9	13.3	2.1
1986/87	8333.5	31.0	69.0	5.6	11.5	2.6
1987/88	9479.8	35.0	65.0	2.3	11.4	1.3
1988/89	12556.0	18.5	81.5	3.6	16.0	1.0
1989/90	13834.3	31.8	68.2	2.9	10.1	0.1
1990/91 [a]	19452.0	49.1	50.9	2.8	0.9	1.3

a Revised budget

Source: Ministry of Finance.

B. Industry

18. In the early 1980s, industrial production in Indonesia was held back by a multitude of regulations and procedures. Both foreign and domestic entrepreneurs had to contend with a complex regulatory environment which, together with a protective import regime (see section C below) inhibited competition and flexibility, encouraged rent seeking and slowed down productivity improvements. The main elements of the regulatory framework were a restrictive investment and capacity licensing system, extensive regulations of foreign investment, rigid land and labour laws and regulations. Foreign exchange controls were lifted in 1970/71.

Table 4. Structure of the non-oil/gas manufacturing sector, selected periods

Branch	Share in total value added (percentage) at current prices		
	1975-77	1981-83	1988-90
Food and beverages	21.5	14.0	13.0
Tobacco	16.2	17.0	10.7
Textiles, clothing, leather products, footwear	15.8	12.6	14.7
Wood products, furniture	3.7	8.3	13.4
Paper, printing and publishing	3.3	2.3	4.2
Chemicals	12.8	12.8	9.5
Rubber products	2.8	3.4	4.6
Plastic products	0.9	0.9	1.4
Pottery, glass and other non-metallic mineral products	6.7	6.5	3.5
Iron and steel	0.8	3.8	8.3
Metal products	3.8	4.1	6.1
Machinery	5.7	6.2	3.5
Transport equipment	5.7	7.9	6.5
Other manufactures	0.3	0.2	0.6
Total	100.0	100.0	100.0

Source: United Nations Industrial Development Organization: *Handbook of Industrial Statistics*, Vienna, 1992.

19. Starting in 1985, a number of measures were taken by the Government in order to simplify the investment approval process and relax controls. In 1985, the maximum number of requirements for an investment application was reduced to 15, compared with

25 in 1984 and 35 in 1977. The Investment Coordinating Board (BKPM) was turned into a "one-step investment agency" by giving it authority to issue most of the major licenses in addition to the investment license. Regulations were further relaxed and streamlined in 1986 and 1987.

20. Efforts to simplify and streamline the investment licensing procedure yielded rapid positive effects. Between 1984 and 1990, the value of approved foreign direct investment projects per year increased from 1,107 to 8,700 million US dollars, of which almost 80 per cent over the period pertained to the manufacturing sector. Approved domestic investment projects increased from 2,100 billion rupiah in 1984 to 59,500 billion rupiah in 1990, of which more than half over the period related to the manufacturing sector. [2]

21. Manufacturing production grew at an average annual rate of 11 per cent between 1984 and 1991, with non-oil/gas manufacturing increasing at a rate of 12 per cent per year. Table 4 shows how the structure of the non-oil/gas manufacturing sector has evolved over the long term. The share of total value added accounted for by consumption goods had decreased over the years, while the share of intermediate and capital goods, although still relatively small, had grown, in particular during the 1970s. The reason why the proportion of the two latter categories increased slower during the 1980s was the need to increase non-oil/gas exports rapidly, which led to a dramatic increase in the production of consumer goods for export.

C. Trade

22. Throughout the 1970s and early 1980s, Indonesia's trade policies were inward-looking, promoting investment in highly protected activities geared to supply the domestic market. At the beginning of the 1980s, the primary instrument of protection was a high and disparate import tariff structure. This was later supplemented by a proliferation of import licenses. By mid-1986, 42.9 per cent of total import value was covered by licensing. This largely offset the reduction and streamlining of tariffs that took place in 1985. In late 1986, following a major devaluation, the Government introduced the first of a series of trade deregulation packages. The primary objective of these trade reform measures was to move away from a trade regime based on license protection towards one based on tariffs. The cumulative impact of trade reform until 1990 is shown in table 5. Table 6 shows the evolution of tariff rates since 1983.

23. As is seen from table 7, which shows the distribution of export income among products, the fall in oil and gas exports has been more than offset by an impressive increase in exports of the non-oil/gas sectors. Most remarkable in this respect is the growth in exports of manufactures: an average annual rate of more than 30 per cent from 1984 to 1991. The surge in non-oil/gas exports is clearly attributable to the trade reforms undertaken in the second half of the 1980s, particularly in terms of the longer perspective. While non-oil/gas exports increased during the 1970s, from 2,033 million US dollars in 1974/75 to 6,171 million US dollars in 1979/80, they fell after that, down to a low of 3,928 million US dollars in 1982/83, due to the general downturn in the world business cycle. They recovered lost ground up to 1985/86, but only following the trade reforms did they rise above 7,000 million US dollars in 1987/88.

Table 5. Coverage of import licensing restrictions, 1986-90, per cent

	Mid 1986	End 1987	End 1988	Early 1990	End 1990
CCCN/HS items	32	22	16	17	14
Import values	43	25	21	17	15
Domestic production	41	38	29	28	25
Manufacturing	68	58	45	38	33
Agriculture	54	53	41	40	38

Note: There is a break in the series between 1988 and 1990 due to the tariff conversion from CCCN to the Harmonized System in 1989.

Source: General Agreement on Tariffs and Trade: Trade Policy Review, Indonesia, Geneva, August 1991.

Table 6. Evolution of average tariffs since 1983

	1983-85	1985(a)	1988(b)	1989(c)	1990(d)
Average tariff rates (per cent)(e)					
Unweighted	37.3	27.0	24.0	27.0	22.2
Weighted					
by domestic production(f)	29.0	19.0	18.0	19.0	16.8
by import value	22.0	13.0	14.5	12.0	10.0
Index of dispersion (percentage points)(g)	61.5	107.8	90.0	92.7	89.0

(a) Following the reform package of March 1985
(b) Following the reform package of November 1988
(c) The Harmonized System introduced on 1 January 1989
(d) Following the reform package of May 1990
(e) Including import surcharges where applicable
(f) Based on a sample of 1,200 tariff positions
(g) Measured by the coefficient of variation

Source: The World Bank. Quoted in General Agreement on Tariffs and Trade: Trade Policy Review, Indonesia, Geneva, August 1991.

Table 7. Value of exports FOB

Product	1984		1991	
	Million US$	Per cent	Million US$	Per cent
Agricultural	2 793.0	12.9	4 389.3	15.1
Timber	365.8	1.7	385.8	1.3
Logs	170.1	0.8	0	0.0
Sawn timber	190.5	0.9	354.3	1.2
Rubber	951.9	4.4	974.5	3.3
Shrimps	194.1	0.9	716.1	2.5
Coffee	567.6	2.6	375.9	1.3
Palm oil	63.3	0.3	335.5	1.2
Minerals and non-ferrous metals	808.1	3.7	1 642.6	5.6
Copper	111.8	0.5	524.1	1.8
Coal	26.5	0.1	263.8	0.9
Nickel	140.1	0.6	256.6	0.9
Bauxite and aluminium	223.0	1.0	191.0	0.7
Tin	276.1	1.3	149.3	0.5
Gold	0[a]	0.0[a]	145.2	0.5
Manufactures	1 839.2	8.5	11 816.1	40.5
Textiles, clothing and footwear	501.0	2.3	5 014.3	17.2
Plywood	791.4	3.6	3034.0	10.4
Machinery and transport equipment	223.2	1.0	668.4	2.3
Furniture	4.1	0.0	384.9	1.3
Fertilizer	37.3	0.2	297.2	1.0
Iron and steel	10.0	0.0	288.3	1.0
Paper	20.7	0.1	266.0	0.9
Miscellaneous	461.7	2.1	749.0	2.6
Total non-oil/gas	5902.0	27.2	18 597.0	63.8
Oil	12 477.0	57.4	6 714.3	23.0
LNG	3 344.7	15.4	3 831.1	13.1
Total	21 723.7	100.0	29 142.4	99.9

a Gold exports were prohibited before 1986.

Source: Biro Pusat Statistik: Indonesian foreign trade statistics

Notes

1. Unless otherwise indicated, figures for years before 1990 in this section are from : Indonesia: Strategy for Growth and Structural Change. World Bank: Report No. 7758 - IND, Washington D.C., 3 May 1989; and Bank Indonesia: Report for the Financial Year 1988/89. Figures for later years are from Biro Pusat Statistik: a monthly statistical bulletin.

2. Figures for 1990 from Far Eastern Economic Review, Hong Kong, 10 January 1991.

II. THE MINERAL SECTOR

A Legislation and institutions

1. Legislation

24. Article 33 of the 1945 constitution outlines the basic philosophy of the Indonesian Government as regards the exploitation of natural resources. The article states:

> "i. Branches of production of importance to the state which vitally affect the life of the people shall be controlled by the state" and
>
> "ii. Land and water and natural resources contained therein shall be controlled by the State and used for the maximum prosperity of the people".

25. Act No. 11 of 1967 and Government Regulation No. 27 of 1980 provide the basic mining legislation. Minerals are grouped into three categories:

A: Strategic minerals
B: Vital minerals
C: Other minerals.

26. Group A minerals include petroleum, natural gas, coal, radioactive minerals, nickel, cobalt and tin. The development of these minerals is, in principle, a government monopoly exercised through state-owned mining companies or other government agencies specially assigned by the Minister of Mines and Energy. In some circumstances, however, deposits of these minerals can be mined by domestic enterprises if this form of operation is considered more favourable to the State. Foreign enterprises can develop these deposits on the basis of a contract with the Government.

27. Group B minerals include iron, manganese, molybdenum, chromite, tungsten, vanadium, titanium, copper, lead, zinc, gold, silver, platinum, diamonds, fluorspar, bauxite, sulphur and various metallic minerals. Deposits of these minerals can be developed by Indonesian enterprises, cooperatives or private citizens. Foreign firms can participate in the development as contractors to the Government or as minority participants in an Indonesian company.

28. Group C minerals include non-metallic minerals such as clays and building materials. Mining of these minerals can only be carried out by Indonesian enterprises, cooperatives or citizens. As for group A and B minerals, foreign companies can, however, conduct mining operations under a contract with the Government.

29. In order to explore for or develop mineral deposits, a Mining Authorization (Kuasa Pertambangan, or KP) is necessary. For minerals in group A and B, the application for a KP is submitted to the Directorate General of Mines of the Department of Mines and Energy. For minerals in group C, provincial governments are authorized to grant permits.

30. Through the various stages of development of a mineral property, different kinds of Mining Authorizations are required. These include:

- General Survey Mining Authorization
- Mining Authorization for Exploration
- Mining Authorization for Exploitation
- Mining Authorization for Processing and Refining
- Mining Authorization for Transportation, and
- Mining Authorization for Sales.

31. A General Survey Mining Authorization is normally granted for one year and is extendable for another year upon request. The Mining Authorization for Exploration is valid for three years with a possible two year extension. These permits are associated with obligations to spend a certain amount of money on survey and exploration activities per year proportionate to the area covered by the permit. The duration of the Mining Authorizations for Exploitation and for Processing and Refining is limited to 30 years with a possibility of extension for 20 years.

32. Regulations concerning taxation and imports are the same for domestic mining companies as for other domestic companies. Mining companies producing for export are entitled to duty-free import of equipment.

33. The legislation also contains provisions for "People's Mining", by which is meant small-scale mining operations based on a Mining Authorization granted by a provincial government, usually to a local cooperative. The area covered by such an authorization, which is given for five years, may not exceed five hectares. No individual or non-cooperative body may hold authorizations totalling more than 25 hectares. Since People's Mining is authorized by the provincial government, while the central government authorizes other mining operations concerning minerals in categories A and B, there have been cases of rights to mine the same deposit having been granted to both People's Mining and mining companies. The Minister of Mines and Energy has the right to decide that an ordinary Mining Authorization takes precedence.

34. Foreign investment in mineral development is regulated by Act No. 1 of 1967 concerning foreign investment. The foreign investor has to establish a joint venture company with one or more Indonesian partners. The joint venture company then applies for a Contract of Work (COW) to the Minister of Mines and Energy. The COW signed between the Minister and the joint venture company has to be approved by the parliament and has the status of law. Chapter III contains a detailed discussion of foreign investment in mining in Indonesia.

2. Institutions

35. The coordination of all mining development in Indonesia is centralized in the Department of Mines and Energy. The Department is organized into four Directorates General:

Directorate General of Mines
Directorate General of Geology and Mineral Resources
Directorate General of Oil and Natural Gas
Directorate General of Electricity and New Energy

36. The first two are responsible for the development of non-fuel mineral activities. The Directorate General of Mines handles negotiations with foreign investors, mine supervision, relations with state-owned mining companies, technological development and technical services to the mining industry and coal mining development. The Directorate General of Geology and Mineral resources is responsible for geological survey activities with some emphasis on volcanology, geothermal energy and engineering geology. Most of its staff is based at the Geological Research and Development Centre in Bandung. There are also ten regional offices which are mainly occupied with technical services to the industry and technical support to provincial governments.

37. Downstream processing of mineral products, including building materials, the chemical industry, the steel industry and the non-ferrous metal industry, is the responsibility of the Department of Industry. The Department of Mines and Energy and the Department of Industry hold regular review meetings to coordinate policies.

38. The Investment Coordinating Board (BKPM) used to play an important role in mineral development under the old system of investment licensing. The deregulatory reforms led, however, to the abolition of investment licenses for mineral-related activities, so that the role of the BKPM decreased radically. The Ministry of Finance exercises a great deal of influence on matters having to do with mineral taxation; there has been continuous discussion about the extent to which investors in mining projects should have a special status as regards taxation.

39. The Department of Mines and Energy is well staffed both in terms of numbers and, in spite of some headhunting by the private sector which is able to offer better salaries, in terms of qualifications. Budget cuts in recent years have, however, necessitated reductions of field-based activities. This has had negative effects on areas of activities such as mine inspection and geological field work.

3. Exploration and resource data

40. Indonesia is relatively well covered by geological maps. Java has been mapped on a scale of 1:100,000, while 75 per cent of the rest of the country has been mapped on the scale of 1:250,000. Recent budget cuts have reduced the rate of this work with the result that some 25 years may be needed to cover the remaining 25 per cent (mainly in Irian Jaya). Airborne geophysical surveys are often carried out simultaneously with geological mapping. In addition, satellite imagery is used as an input to geological mapping.

41. Some detailed exploration work is carried out by the Department of Mines and Energy. From the Government's point of view, however, detailed exploration should be the responsibility of state-owned enterprises.

42. It is estimated that 60 per cent of all exploration (in terms of activity) in Indonesia is carried out by foreign companies. In terms of expenditure, the share of foreign enterprises is even greater, given their higher salary costs. Most of the exploration for new deposits by foreign enterprises is oriented towards gold.

43. Geological data resulting from mapping and exploration activities by the private sector have to be handed over to the Government when an exploration or mining license expires and no further activities are planned. These data are utilized for geological mapping by the Government. Results of geological survey work undertaken by the Department of Mines and Energy are usually given first to the state-owned mining companies, the reason being that they contribute to the work by lending equipment etc.

44. As a result of strict reporting requirements by mining enterprises, the Government has accumulated a very detailed information base covering mineral occurrences. A decision has been taken to publish this information, and a first volume, covering non-metallic minerals, was issued in 1990. [1] This volume provides details on mineral deposits, including:

- location;
- chemical and mineralogical composition of the deposit;
- stage of exploration or exploitation;
- assessment of reserves, if available, and
- geological context of the deposit.

45. A computer based Geographical Information System (GIS), of which geological information forms a part, has recently been established. This publicly accessible system includes the basic geological map, geothermal locations, geophysical survey data, tectonics, geochemistry and environmental baseline information. Data on mineral deposits are in the process of being added.

B. Overview of the mineral sector

1. Production, exports and imports

46. Table 8 shows the development of Indonesian non-fuel mineral and metals production from 1983 to 1991. Tin, nickel, copper and bauxite are the most important minerals mined in the country. Aluminium is produced from imported alumina; steel is mainly produced from imported iron ore and scrap.

47. According to the table, production of all metals and minerals increased over the period, in most cases quite dramatically. For the future, gold is the mineral product that is expected to show the fastest growth in terms of both production and exports. It should be mentioned that coal production, which is not included in the table, also expanded rapidly, from 648 thousand tons in 1983 to 14.1 million tons in 1991. Coal production is expected to continue rising.

Table 8. Mineral and metal production 1983-91
(thousand metric tons unless otherwise indicated)

Mineral/metal	1983	1987	1991
Bauxite	778.0	635.0	1406.0
Aluminium	114.8	201.4	173.1
Nickel in concentrate	41.2	59.9	66.1
Ferronickel	4.9	3.1	5.3
Nickel matte	18.3	26.2	37.1
Tin in concentrate	26.5	26.1	28.7
Tin metal	28.4	24.2	28.6
Copper in concentrate	78.6	105.3	211.7
Iron sands	124.9	194.0	173.2
Crude steel	983.0	2 059.0	3 000.0
Silver metal (tons)	1.8	6.6	16.4
Silver in copper concentrate (tons)	33.4	45.3	61.4
Gold metal (tons)	0.3	0.7	3.3
Gold in copper concentrate (tons)	2.1	3.0	13.7

Sources: Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993 (figures on ferronickel, nickel matte, iron sand, gold, silver), and UNCTAD: Commodity Yearbook (all other).

48. Table 9 shows the composition of Indonesian mineral exports during the 1980s and the main destinations for the more important export products. Exports are heavily concentrated in four products (copper concentrates, nickel matte, unwrought aluminium and unwrought tin) accounting together for about 80 per cent of the total export value. The regional market is of overwhelming importance, with two-thirds of exports going to Japan and 15 per cent to Singapore, which is the destination of most tin exports. The share of exports to Japan has increased over time, while that to Western Europe has decreased. The bulk of the exports take place under long-term contracts, and in one case, that of aluminium, exports go to the foreign partner in a joint venture project. Exports of semi-fabricates, which have been growing over the past decade, go mainly to the regional market. Coal export revenues increased from 11.6 million US dollars in 1983 to 239.2 million dollars in 1991.

49. In imports, raw materials for the iron and steel industry figure prominently with primary iron and steel, iron and steel waste and scrap, iron ore, pig iron, ferroalloys and direct reduced iron together accounting for almost 60 per cent of the import value (including semi-fabricated metal products). Unwrought non-ferrous metals is the other large group, while semi-fabricated products have a relatively small share of imports, because of the expansion of semi-fabricates production in Indonesia. Imports

Table 9. Exports of minerals and metals
(thousand metric tons volume unless otherwise indicated and million US dollars value)

Product	1983		1991		Three main destinations in 1991, per cent of value
	Volume	Value	Volume	Value	
Copper concentrates [a]	76.9	107.6	234.2	498.5	Japan 69.1 Republic of Korea 7.7 United States 5.2
Nickel matte [b]	17.1	105.4	34.8	223.2	Japan 100.0
Unwrought aluminium	90.7	128.8	123.0	161.6	Japan 93.9 Singapore 4.9 Thailand 1.0
Unwrought tin	24.9	309.2	27.7	149.1	Singapore 80.9 Netherlands 16.6 United Kingdom 2.0
Ferronickel	5.7	25.4	5.4	42.3	Japan 56.2 Netherlands 43.8
Nickel concentrates [a]	10.3	13.4	33.9	42.0	Japan 74.2 Australia 24.6 D.P.R. Korea 1.2
Bauxite	786.3	11.8	1077.0	14.9	Japan 62.2 United States 34.9 United Arab Emirates 2.9
Iron sands	10.3	0.1	0.0	0.0	n.a.
Silver in copper concentrate (tons)	33.0	(c)	58.5	(c)	n.a.
Gold metal	0.0	0.0	2.3	n.a.	n.a.
Gold in copper concentrate (tons)	2.0	(c)	12.8	(c)	n.a.

a: Metal content; b: Combined nickel and cobalt content; c: Included in copper concentrates.

Sources: Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993 (figures on ferronickel, nickel matte, iron sand, gold, silver), UNCTAD: Commodity Yearbook (all other), Biro Pusat Statistik: Indonesia Foreign Trade Statistics (export destinations).

are sourced widely, with a large and increasing proportion coming from developing countries outside the region, in particular Latin America. This is a reflection mainly of the growing demand of the iron and steel industry for raw materials, which have largely been obtained from Brazil, making that country Indonesia's most important source of mineral imports. Imports of unwrought copper from Chile are also important. Imports from countries in the region are however significant, in particular from the newly

industrialized countries.

50. In the following sections, developments over the past few years for the main mineral products are reviewed. [2]

2. Tin

51. During the 1970s and first half of the 1980s, Indonesia accounted for between 10 and 15 per cent of the world's tin production both at the mine and metal stage, and was the world's second or third largest producer. Tin represented 45 to 70 per cent of Indonesia's total non-fuel mineral exports. The collapse of the International Tin Agreement in 1985 and the subsequent fall in tin prices, together with the emergence of Brazil and China as major exporters, have reduced both Indonesia's market share and its tin export earnings. Tin exports now account for less than 15 per cent of the value of total non-fuel mineral exports.

Table 10. Tin production by company (metric tons tin content)

Company	1984	1987	1991
Mine production	23 231.8	26 217.0	38 286.0[a]
P.T. Tambang Timah	17 607.5	21 635.5	30 390.0
P.T. Koba	4215.0	4 042.0	7 668.0
P.T. Gunung Ki-Kara Mining(b)	481.9	539.5	228.0
P.T. Riau Tin Mining(c)	927.4	0.0	0.0
Smelter production	22 467.0	24 200.0	28 600.0

(a) Total differs from the figure in table 8 since it refers to total contained tin in concentrate and not only recoverable tin content.
(b) Formerly Preussag/Bekas
(c) P.T. Riau Tin Mining has terminated its operation and returned its contract area to the government.

Sources: Department of Mines and Energy: Indonesian Mining Yearbook, 1988 (figures for 1984 and 1987) and Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993 (figures for 1991).

52. The government owned P.T. Tambang Timah, with its main production facilities on or around the islands of Bangka, Belitang and Singkep, accounts for about 75 per cent of the tin ore production in Indonesia; it also owns the Peleburan Timah (Peltin) smelter, the only tin smelter in the country. Since the smelter, with a nominal production capacity recently increased to 45 000 tons per year, is able to smelt the entire mine production, only small quantities of tin concentrates are exported. Owing to a combination of falling tin prices and rising production costs, P.T. Tambang Timah registered a loss of 2.2 million US dollars in 1990, its first ever. Average production costs in 1990 were 6,000 US dollars/ton, with costs being higher for the onshore deposits, which are mainly exploited

using gravel pumps, and slightly lower offshore, where dredges, allowing better economies-of-scale, are used. Labour productivity is low, with average annual production per employee in 1990 at 1 ton of tin, compared with an average of 25 tons for the Australian tin producers and 3.5 tons for the ot'.er Indonesian producer P.T. Koba. The company has initiated a cost-cutting programme, according to which the number of employees will be cut from 24,000 to 12,000. The onshore mines have been sub-contracted to private companies. In order to facilitate the restructuring programme, the Government has decided to invest 150,000 million rupiah (about 75 million US dollars) in Timah and to grant it a loan of 287,000 million rupiah (145 million US dollars) over six years. The objective is to reduce average production costs to 4,500 US dollars/ton by 1995. [3]

53. The other main tin producer in the country is P.T. Koba, a joint venture between Kajuara Mining Corporation Pty. Ltd. of Australia (75 per cent) and P.T. Tambang Timah (25 per cent). P.T. Koba works under a COW from 1971. P.T. Gunung Ki-Kara Mining, which has taken over operations previously owned by Preussag, also operates under a COW from 1971.

54. The bulk of Indonesian tin production is exported, with domestic consumption, mainly for tinplate (a tinplate facility in West Java was completed in the mid-1980s) accounting for about 5 per cent of production. Exports go mainly to Singapore and the Netherlands.

3. Nickel

55. P.T. Aneka Tambang, which is a government-owned company, mines nickel at Pomalaa in South Sulawesi and on Gebe Island in the Moluccas. The Gebe Island site accounts for about three-quarters of the production. Most of the ore is exported, mainly to Japan and Australia, with minimal processing, but some is used to produce ferronickel with an average content of about 25 per cent nickel in the company's plant at Pomalaa. The ferronickel is exported, mainly to Japan and the Netherlands. The plant was overhauled in 1987 following a breakdown. Aneka Tambang plans to double, and eventually quadruple, output of ferronickel.

56. P.T. Inco operates a mine under a COW from 1968 at Soroako in south Sulawesi. The nickel is processed into nickel matte with an average nickel content of 78 per cent. Because of the weak nickel market and initial technical problems, the plant in the past usually operated far below capacity, which until recently was 36,000 tons per year. P.T. Inco is owned by Inco Ltd. of Canada (58 per cent), Sumitomo (22 per cent) and other private shareholders (20 per cent). The last category of owners entered the company following a public share offering on the Jakarta Stock Exchange in April 1990. Under the COW, Inco was obliged to offer 2 per cent of the equity per year during the first ten years of operation to Indonesian interests. Because of low nickel prices and consequently low profitability of the company, there was no interest from the Government in the offer until 1988/89, when nickel prices increased dramatically and the public share offering was approved. Production capacity was increased to 47,600 tons per year in early 1991. About 80 per cent of exports go to Tokyo Nickel, which is 45 per cent owned by Inco, with the

remainder going to Sumitomo.

Table 11. Nickel production by company (thousand metric tons metal content)

Company	1984	1987	1991
Mine production	47.8	57.2	66.1
P.T. Aneka Tambang	22.5	30.7	29.0[a]
P.T. Inco(b)	25.3	26.2	37.1
Ferronickel production (P.T. Aneka Tambang)	4.8	3.1	5.3

(a) Estimate
(b) Combined nickel and cobalt content in nickel matte (cobalt accounts for 1.0 to 1.5 per cent of the total metal content).

Sources: Department of Mines and Energy: Indonesian Mining Yearbook, 1988 (figures for 1984 and 1987) and ndonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993 (figures for 1991).

4. Bauxite and aluminium

57. The bauxite/aluminium industry in Indonesia consists of two operations: P.T. Aneka Tambang's bauxite mine on Bintan Island, and P.T. Indonesia Asahan Aluminium's (Inalum) smelter at Kuala Tanjung on Sumatra. Bauxite mining started on Bintan Island in 1935, during the colonial period. Following independence, the operations were nationalized. Production was between 500 000 and 1 million tons per year in the 1980s. In recent years it has been close to 1.3 million tons. The bauxite is mainly exported to Japan under a five-year contract with prices linked to aluminium quotations at the London Metal Exchange. Some bauxite is also exported to the Republic of Korea under a long-term contract expiring in 1996. [4] Reserves are sufficient for seven to eight years' production at the current rate of mining. Aneka Tambang is at present exploring for bauxite in Kalimantan. The possibility of establishing an alumina refinery close to the mine has been under study for several years.

58. Inalum's aluminium smelter is located at Kuala Tanjung on the eastern coast of Sumatra. The smelter began operations in 1982. Its production capacity is 225 000 tons per year. The smelter, however, never reached full capacity utilization, owing to a shortage of electrical power. In most years, production has been about 200 000 tons. The company is owned 41.13 per cent by the Government, with ownership exercised by the Department of Industry, and 58.87 per cent by Nippon Asahan Aluminium Co. Ltd., a consortium of several Japanese companies with interests in the aluminium industry. The present ownership shares reflect an agreement made in 1987, when the financial package for the smelter was changed. Before that, the Government held 25 per cent of the equity, and Nippon Asahan 75 per cent. [5] Alumina is imported mainly from Alcoa of Australia's refineries in Australia, with additional quantities coming from India. Some 60 per cent of the smelter's production goes to the members of the Nippon Asahan consortium,

under an agreement made in December 1988, following negotiations over the division of production. [6] The rest goes to the domestic Indonesian market.

5. Copper

59. Freeport Indonesia, of which 90 per cent is owned by Freeport Mc Mo Ran Copper & Gold of the United States and 10 per cent by the Indonesian Government, is the only significant copper producer in Indonesia. It operates under a COW from 1966, revised in 1991, and mines at Gunung Bijih in Irian Jaya. Production started in 1972 and has increased gradually. In 1991 it reached almost 657 000 tons of concentrate containing about 221 000 tons of copper, 61 tons of silver and almost 14 tons of gold. The entire production is exported in concentrate form, with about 70 per cent going to Japan under a long-term contract. A new major orebody, the Grasberg deposit, was discovered close to the existing mine in 1988. Mining of this deposit started in early 1990.

60. The possibility of smelting and refining the copper concentrate in Indonesia has been the subject of recurrent discussions between Freeport and the Government. A project aiming at the construction of a smelter and a refinery is now under way in cooperation with Metallgesellschaft of Germany, Nippon Mining of Japan and the domestic company Petrokimia Gresik. The capacity is likely to be 130 000 tons per year and the complex is planned to be in operation in 1996. [7]

6. Gold and silver

61. Gold and silver production has increased rapidly in Indonesia over the past several years and is poised to increase even further, making these metals major earners of foreign exchange. Statistics on production of precious metals are less complete than for other minerals. Table 12 shows gold and silver production in 1988 and 1991 by the major producers. The largest producer, which began production in 1992, is not included in the table (see below). It should be noted that the table (like table 8 above) probably underestimates total gold production somewhat. Exact figures for P.T. Aneka Tambang, which produces gold and silver at the Cikotok mine in West Java, are not available for 1991. Gold production at this mine had declined from over 200 kilograms per year in the mid-1980s to 140 kilograms in 1990. Silver production has generally been between 2 and 2.5 tons. P.T. Aneka Tambang has the country's only gold refinery with an annual capacity of 50 tons. In addition to refining gold concentrates, it also processes gold belonging to traders so that they can get pure gold certificates for export purposes.

62. The largest gold producer in the country is P.T. Kelian Equatorial Mining, which started operating its mine in East Kalimantan in January 1992. The company is 90 per cent owned by Kelian Pty. Ltd., an Australian company, and 10 per cent by the Indonesian company P.T. Harita Jaya Raya. In the first eight months of 1992, some 8.9 tons of gold and 9.1 tons of silver were produced. The second largest producer is P.T. Prima Lirang, which operates the Lerokis mine on Wetar Island. The company is owned 90 per cent by Billiton and 10 per cent by the Indonesian company, P.T. Prima Maluku Indah. Operations started in July 1991 and production is planned to be between 2 and

3 tons of gold per year. P.T. Lusang Mining operates the Rejang Lebong mine in Bengkulu, on south Sumatra. This mine was exploited in colonial times then subsequently closed. The company, which is owned 70 per cent by Billiton and 30 per cent by the Indonesian company, P.T. Lebong Tandai, started production in April 1986. P.T. Ampalit Mas Merdana, owned by two Australian and one Indonesian company, started production in Kalimantan in October 1988. P.T. Monterado Mas, now owned by RTZ, started production in August 1989. In early 1991, however, the company ceased producing and closed its operations. Three major gold projects with foreign investment are the subject of feasibility studies, and a large number of exploration projects are under way.

Table 12. Gold and silver production (kilograms metal content)

Company	Gold		Silver	
	1988	1991	1988	1991
In copper concentrates P.T. Freeport Indonesia	3 755.4	13 704.5	55 041.7	61 448.3
Metal	996.7	3 306.7	6 790.9	16 409.3
P.T. Lusang Mining	767.6	718.2	3 972.0	3 486.0
P.T. Monterado Mas Mining	-	42.8	-	6.8
P.T. Prima Lirang	-	1 908.0	-	10 983.0
P.T. Ampalit Mas Perdana	34.6	377.9	-	10.2
Others(a)	194.5	259.8	2 818.9	1 923.5

(a) Including P.T. Aneka Tambang (165 kilograms in 1988).

Source: Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993.

63. A number of domestic companies are mining gold, but their total production is modest. Artisanal gold mining, some of it illegal, also accounts for part of the production, although less than before, and this production is not included in official statistics.

7. Iron and steel

64. The only iron-bearing materials mined in Indonesia are the iron sands at Cilacap, central Java. These are mined by P.T. Aneka Tambang. Production has been around 200 thousand tons in recent years.

65. The Government-owned Krakatau Steel operates a direct reduced iron (DRI) plant and an integrated steel plant with an annual crude steel capacity of 1.5 million tons per year, based on imported raw materials. Capacity is to be increased to 2.5 million tons

per year. P.T. Ispat Indo is planning to build at Surabaya in Java a 950,000 tons-per-year steel plant relying on direct reduced iron . There are also two electric furnaces using mainly scrap, owned by Ispat Indo Steel and Tosan Prima Murni, with steel billet capacity of 390,000 and 250,000 tons per year, as well as several smaller steel-making enterprises, rolling mills etc. Crude steel production in 1991 was 3 million tons. [8]

8. Non-metallic minerals

66. The most important non-metallic minerals produced in Indonesia in value terms are sulphur, bentonite, dolomite, granite, kaolin, quartz sand, silica stone and marble. With the exception of P.T. Karimun Granite, which operates a granite quarry on Riau Island, and six or seven marble quarries opened up in the late 1980s with the participation of companies from Japan, the Republic of Korea and Taiwan Province of China, non-metallic minerals production is the domain of domestic enterprises, many of them quite small. Exports of granite and marble account for important portions of production.

C. Economic importance of the mineral sector

1. Macro-economic importance

67. The mining sector's contribution to the GDP of Indonesia is relatively low, slightly above 1 per cent. This figure does not include all downstream activities, in particular the further processing of minerals mined in the country. A broad definition of the mineral sector should also include the iron and steel industry as well as the non-ferrous metal industry, although it could be argued in the case of Indonesia that since neither the steel nor the non-ferrous metals industry (with the exception of tin and nickel) is based on domestic raw materials they should not be included in an analysis which takes as its starting point the management of the natural resources of the country.

68. Even with a very broad definition, however, the non-fuel mineral sector occupies a modest place in the Indonesian economy in relative terms, although it is rapidly expanding both of volume and diversity of products. Consequently, Indonesia is not dependent on non-fuel minerals in the sense that changes in international markets for these commodities would drastically affect the macroeconomic performance of the country.

69. Other indicators of the importance of the mineral sector yield similar results. Employment in mining and quarrying, including oil, gas and coal, is around 400,000 persons or 0.7 per cent of the labour force. Most of this employment is in non-metallic minerals exploitation for local markets.

70. While the direct employment effects of mineral development are small, as could be expected, the indirect effects may be substantial. There is unfortunately very little data available on the specific employment effects in the regions where major mineral development has taken place. It is, however, interesting to note that according to a study

by I.J. Aziz, [9] in which the employment effects of export expansion are analysed using the input/output table for Indonesia, the employment effects of mineral and metal exports have been quite significant when the indirect effects are taken into account. In 1985, coal and metal ore mining ranked as the eighth and non-ferrous basic metal industries as the fifteenth sector when all sectors were ranked according to the employment generated by a given increase in exports. It is also significant that these ranks have improved over the years (comparisons were made with 1971, 1975 and 1980), illustrating that with the increasing diversification of the economy, it has become easier to exploit linkage opportunities. It is not possible to distinguish between local, regional and national employment effects from the study. However, another study by the same author [10] showed that the effects were largely concentrated in Java and Sumatra. The local employment effects may in any case have been substantial, since mineral development has generally taken place in areas where the addition to labour income is likely to have increased local demand significantly and to have generated additional employment in agriculture and services.

71. Exports of non-fuel minerals and metals (excluding iron and steel) were 1 378.8 million US dollars in 1991, or 4.7 per cent of total exports, down from a peak of 7.3 per cent in 1989, when copper, aluminium and nickel prices were high. The proportion is unlikely to increase significantly in the future, given the rapid expansion of exports of manufactures. The already realized and expected increase in gold production may add between 100 and 200 million US dollars at present prices to 1991 export incomes, and the expansion of Freeport's operations is likely to have added about 300 million US dollars more, at present prices. It thus appears that if the mineral sector is able to retain its share of exports, this should be considered a respectable achievement of significant importance to the national economy.

72. Another reason why a continued very high rate of growth in exports appears unlikely is that domestic consumption of most metals and minerals is expected to increase rapidly in the future, given the emphasis placed by the Government on expanding production of manufactures. The increased domestic demand will result in smaller quantities being available for export. To some extent, this development has already occurred in the case of aluminium.

73. Total tax income from mining companies was around 200 million US dollars in 1989/90 and 1990/91, corresponding to about 1 per cent of total government revenue or 2 per cent of domestic non-oil revenues. It should be noted that the major mining companies had suffered large losses in the past which were carried forward and reduced the amount of taxable income. The figures therefore understate potential contribution to government income from the mining industry. The mining industry can not be said to occupy an especially privileged position with regard to taxation, apart from the immunity to subsequent legislation conferred on holders of COWs (see chapter III). Holders of COWs accounted for 56 to 64 per cent of government income from the industry in the late 1980s and early 1990s, with the balance being made up mainly by the state owned companies, in particular P.T. Aneka Tambang. The fact that Indonesia is considered to offer good opportunities for investment by major international mining companies indicates that the Indonesian Government has solved the "taxation problem" mentioned in the Introduction in a manner that yields significant income for the Government without

discouraging investment. Investment in mining accounted for 6.2 per cent of total foreign and 1.1 per cent of total domestic investment during the period 1967 to September 1992. [11] It should be noted that, owing to the weakness of metal markets, investment in mining was very low in the years 1990 to 1992. [12]

2. Linkages with other sectors

74. The mineral sector's linkages to other sectors can be studied through input/output analysis. In the case of Indonesia, input/output tables are prepared for the whole economy every five years. Since the table for 1990 is not yet available, the discussion in the following is based on the 1985 input/output table. [13] It should be noted that the trade liberalization measures undertaken since then are likely to have changed the situation considerably by allowing the replacement of domestic inputs by imports in many sectors.

75. The basic input/output table for Indonesia consists of 66 sectors. There is also a more aggregated 19-sector version, but since it aggregates fuel and non-fuel mining, it is less useful for the present purpose. The sectors of interest are:

- coal and metal ore mining
- other mining and quarrying
- manufacture of non-metallic mineral products
- manufacture of basic iron and steel
- manufacture of non-ferrous basic metals

76. Table 13 shows the direct backward linkages of these sectors (with crude oil and gas mining included for the sake of comparison) in the form of input coefficients, that is, the amount of inputs needed from other sectors in order to produce one unit of output in the sector studied.

77. The three mining sectors use relatively little intermediate inputs in relation to total production, and value added constitutes the bulk of the production value, as would be expected. The three processed products sectors use considerably more intermediate inputs, including imported ones. It is also evident from the table that inputs from the sectors themselves are important in some sectors, for example in basic iron and steel.

78. A very crude measure of the degree of a sector's integration in the national economy is provided by the number of sectors from which it obtains inputs and the number of sectors to which it delivers outputs. This is shown in table 14. The mineral sectors obtain inputs from about half or less of the other sectors and, with the exception of the manufacture of non-metallic mineral products, which delivers its outputs to more than two-thirds of all the sectors, the outputs go to relatively few sectors.

Table 13. Direct backward linkages of the mineral sector in Indonesia in 1985 (input coefficients)

Sector	Total domestic intermediate inputs	Imports	Most important sectors	Total value added
Coal and metal ore mining	0.301	0.023	Petroleum refining (0.069) Manufacture of machinery (0.040) Coal and metal ore mining (0.035)	0.677
Crude oil and natural gas mining	0.110	0.013	Crude oil and natural gas (0.040) Real estate and business services (0.017) Financial intermediaries (0.013)	0.878
Other mining and quarrying	0.158	0.001	Petroleum refining (0.044) Other services (0.026) Road transport (0.024)	0.841
Manufacture of non-metallic mineral products	0.413	0.089	Trade (0.113) Other mining and quarrying (0.054) Petroleum refining (0.030)	0.498
Manufacture of basic iron and steel	0.373	0.168	Basic iron and steel (0.112) Electricity, gas and water (0.039) Trade (0.036)	0.459
Manufacture of non-ferrous metals	0.436	0.195	Coal and metal ore mining (0.156) Non-ferrous metals (0.047) Trade (0.044)	0.369

Source: Biro Pusat Statistik: Indonesian Input-Output Table 1985, Jakarta, June 1989.

Table 14. Number of sectors with which the mineral sectors in Indonesia had direct transactions in 1985 (Total number of sectors is 66)

Sector	Inputs obtained from	Outputs delivered to
Coal and metal ore mining	25	15
Crude oil and natural gas mining	25	4
Other mining and quarrying	25	20
Manufacture of non-metallic mineral products	34	45
Manufacture of basic iron and steel	31	16
Manufacture of non-ferrous metals	31	18

Source: Biro Pusat Statistik: Indonesian Input-Output Table 1985, Jakarta, June 1989.

79. In order to obtain a measure of the total linkages of a particular sector, the inverse of the input-output matrix can be calculated. This is called the Leontief inverse and shows the direct and indirect increases in production in all sectors resulting from an increase in output of one unit in a particular sector. The sum of all the coefficients in the inverted table measures total backward linkages. A figure of 1.5 for total backward linkages, for instance, therefore means that an increase in production by one unit in the sector concerned will give rise to a total production increase of 0.5 in other sectors (and in the sector itself). Table 15 shows total backward linkages for six mineral sectors in the Indonesian economy as well as their ranking in terms of these linkages. Of the other sectors, only the three with highest backward linkages are shown. The processed products sectors end up among the top half of the 66 sectors, while the other three sectors have lower than average total backward linkages.

Table 15. Total backward linkages of mineral sectors in Indonesia in 1985

Sector	Rank	Total backward linkages
Electricity, gas and water supply	1	2.236
Manufacture and processing of food	2	2.077
Cereal mill products	3	2.048
Manufacture of non-ferrous metals	19	1.652
Manufacture of non-metallic mineral products	23	1.624
Manufacture of basic iron and steel	27	1.590
Coal and metal ore mining	38	1.447
Other mining and quarrying	50	1.251
Crude oil and natural gas mining	58	1.148

Source: Biro Pusat Statistik: Indonesian Input-Output Table 1985, Jakarta, June 1989.

80. While inter-country comparisons are always difficult to undertake in input-output analysis since sector classifications differ from country to country, the results above do not appear to show that the Indonesian mineral sector is particularly badly integrated. Total backward linkages of non-oil minerals production have been calculated at 1.629 in Chile, 1.513 in Mexico and 1.92 in Peru. [14] In all three cases, basic metals production was included in the non-oil minerals sector.The mineral sector in Indonesia thus appears to have slightly less important backward linkages than is the case in developing countries with a longer history of mining and metals production.

3. Other development effects of the mineral sector

81. The Indonesian Government clearly sees the positive stimulus to regional development as one of the main benefits of mineral development activities. In a country as spread out and diverse as Indonesia, the Government is understandably concerned about national cohesiveness and the need to ensure that all parts of the country benefit from the economic growth process. Mineral sector activities can play a role in this context by providing infrastructure which offers opportunities for other local and regional economic activities to obtain needed inputs more cheaply and to distribute their production to customers. In addition, while the direct employment effects of mineral development may be small, the indirect effects, taking into account both increased demand for inputs from other sectors and the effects of a general increase in income, can be quite significant. In particular, even a relatively limited mining activity would provide a large addition of cash income to areas where the general economic activity is subsistence farming. Chapter III discusses the impact of the large-scale mining projects undertaken by foreign investors.

82. Except for artisanal gold mining, small-scale mining, in particular of non-metallic minerals, takes place in the more populated and economically developed parts of the country. These activities have small linkage effects as measured by input/output analysis, which is to be expected, given their labour-intensive nature and low level of technological sophistication. Nevertheless, their importance to the local economy may be much greater, in particular in terms of increased cash income which raises local demand for food products and services. Artisanal gold mining constitutes a special problem. In many areas, particularly in Kalimantan, artisanal gold mining has been carried out by people who are not originally from the area. In some cases, this has led to conflicts with the local population over environmental degradation and land use. The Government is attempting to deal with this problem through the "PSK concept" (see chapter IV).

Notes

1. Directorate of Mineral Resources, Department of Mines and Energy: Bahan Galian Industri di Indonesia, Bandung 1990.

2. Unless otherwise indicated, information in the following sections is from Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993.

3. Metal Bulletin, London, 2 July 1990, and American Metal Market, New York, 23 January 1991.

4. International Bauxite Association Quarterly Review: October-December 1986.

5. Metals Week, New York, 22 June 1987.

6. Japan Metal Bulletin, Tokyo, 15 December 1988.

7. UNCTAD: A Review of Major Developments in the World Copper Market and Industry from 1980 to 1992 and Future Prospects (UNCTAD/COM/37), Geneva, 1993.

8. Data on production capacities from SEASI Directory 1990, South East Asia Iron & Steel Institute, Pasay City, Philippines.

9. I. J. Aziz: Export Performance and Employment Effect. Inter-University Center Economics, University of Indonesia, Working Paper No. IV.3/1989.

10. I. J. Aziz: Spatial Implication of the Export Promotion Strategy in Indonesia. Inter-University Center Economics, University of Indonesia, Working Paper No. III.4/1990. In this study, which is based on the 1980 Indonesian input/output tables, the regional distribution of the direct and indirect effects of a unit change in final demand is analysed. While for a unit change in Java, 89.6 per cent of the effects appear in Java, 67.9 per cent of the effects of a change in Sumatra appear in that region. For Kalimantan, Sulawesi and the rest of Indonesia, the corresponding figures are respectively 31.6, 14.1 and 9.9 per cent. Sumatra and Java consistently account for large portions of the effects.

11. Biro Pusat Statistik: Monthly Statistical Bulletin.

12. The other two problems referred to in the Introduction, the macroeconomic problem and the absorption problem, are not strictly relevant to the non-fuel mineral sector in Indonesia, given the sector's limited size relative to the whole economy. Nevertheless, these problems as they relate to the oil and gas sector have obviously been a major concern in the context of Indonesian economic policy during the 1980s and 1990s. Indonesia has, broadly speaking, managed to solve the problems more successfully than most oil dependent developing countries. The successful diversification of exports and the low rate of inflation, combined with a healthy rate of growth in GDP, deserve to be noted in this context. Furthermore, the neglect of non-mineral sectors, in particular agriculture, so common in mineral dependent countries, is absent in Indonesia. Agricultural production, in particular of rice, has increased and Indonesia has become a net exporter of rice.

13. Biro Pusat Statistik: Indonesian Input-Output Table 1985. Jakarta, June 1989.

14. Figures for Chile and Mexico from V. Bulmer-Thomas: Input-Output Analysis and the Mineral Sector in Developing Countries. Report prepared for UNCTAD, June 1989 (unpublished). Figures for Peru from Instituto de Estudios Económicos Mineros: La Importancia Económica de la Minería en el Perú. Lima, January 1991. Quoted in UNCTAD "The mineral sector in Peru" (UNCTAD/COM/28) Geneva, December 1993.

III. FOREIGN INVESTMENT

A. Legal framework

83. Foreign investment in mineral development is regulated by Act No. 1 of 1967 concerning foreign investment. The foreign investor has to establish a joint venture company with one or more Indonesian partners. The joint venture company then applies to the Minister of Mines and Energy for a Contract of Work (COW). For investment in coal mining, negotiations with investors are based on the model Coal Cooperation Contract, which was drawn up in 1990. In the following, only investment in non-fuel mineral mining is considered. [1]

84. The COW signed between the Minister and the joint venture company has to be approved by the parliament and has the status of law. While this allows some variation in contract conditions, the main features of the COW are standardized and designed in accordance with the relevant legislation. One of the attractive features of the COW from the investor's point of view is that since it has the status of law, conditions cannot be changed by administrative decisions.

85. The COWs have been concluded in batches or generations, with contract conditions more or less standardized within each generation. The first generation of COWs, in 1967, consisted of only one project, the development by Freeport Indonesia Inc. of a copper mine in Irian Jaya. The second generation of COWs (1968 to 1972) included some major projects, such as the development of nickel deposits by International Nickel Co. of Canada Ltd. (Inco) and tin mining by Koba Tin of Australia and Preussag of Germany. The first and second generation COWs were generally considered favourable to foreign companies. The contract benefits included tax holidays for a certain period (first generation), no requirement for repatriation to Indonesia of export proceeds, duty free imports and exemption from land taxes (second generation). Conditions were considerably tightened in the third generation (after 1976). Among the changes introduced were abolition of the tax holiday, introduction of a tax on windfall profits, renegotiation of the contract after completion of a feasibility study, a requirement to establish a joint venture with an Indonesian company, and a requirement to establish processing facilities in Indonesia, if economically feasible. The third generation attracted considerable criticism from the industry, and some of the features criticised were removed in the fourth generation (1984-1987), in particular the tax on windfall profits and the provision for renegotiation of contracts after the feasibility study. As of the fourth generation, conditions also provide protection against future changes in legislation. The fourth generation attracted a flood of applications from companies aiming to explore for gold. Almost 100 COWs were approved. Subsequently, it has turned out that several of the companies involved were too small, inexperienced or financially weak to fulfil their obligations effectively. In 1989, a fifth generation was introduced, containing provisions for additional royalties on exports of unprocessed minerals which were designed to encourage domestic processing. The conditions were considered unattractive and no contracts were signed. In a modified fifth generation, in contracts which have recently been concluded or are under negotiation, these provisions have been omitted but financial conditions have been tightened in order to ensure that the companies involved

have the capability to undertake the exploration and development work. This generation, often called the "frontier" COWs, also aims at attracting investment to the eastern parts of the country and to minerals that are not currently the object of large scale exploitation, such as kaolin and other clay minerals. Table 16 shows the situation in mid-1992 with regard to all the COWs concluded.

Table 16. Status of Contracts of Work (COWs) in mid-1992

Generation	Terminated	In force			
		General survey	Exploration	Feasibility study	Exploitation
I	1*	-	-	-	-
II	12	-	-	-	4
III	7	-	3	1	2
IV	43	1	45	2	3
V	-	2	-	-	1
Total	63	3	48	3	10

* Replaced by fifth generation COW

Source: K. Gandataruna: Indonesian Mining Status and Goals for the Nineties (in Indonesian Mining Association: Indonesian Mineral Development 192, Jakarta, 1993)

86. The COW is of necessity a very detailed document, since it defines independently most of the conditions for investment that are otherwise covered by existing law. In the following, the most important features of the COWs currently under negotiation (the modified fifth generation) are reviewed:

Specification of work to be carried out and reporting requirements

87. While the COW generally leaves decisions on the exact operations to be carried out at each stage to the investor, it includes detailed instructions regarding reporting requirements. At regular intervals and at the end of the successive stages of exploration (which are limited to predetermined periods of time, at the end of each of which a part of the contract area has to be relinquished), detailed reports on the operations performed and plans for further work have to be submitted. During the exploitation stage, reports covering all details of the activities, including work programme, budget, sales contracts, employment, equipment, inputs used, etc., have to be prepared. The effect of the reporting requirements is to enable the Government, at least potentially, to be almost as fully informed about the operation as the foreign investor and to be able to take quick action on any problems that may arise. In addition to the reporting requirements, the COW also obliges the investor during the exploration stages to spend a certain amount of money per square kilometre of contract area. This work obligation

is backed by a deposit and a bank guarantee which are forfeited if the company does not fulfil its work and reporting obligations. While data and reports submitted by the company are treated as confidential by the Government, an exception is made for information of scientific rather than commercial value or that which is considered to be in the public domain for other reasons (such as having been published elsewhere). Through this provision, the Government gains access to a great deal of geological information.

88. The extent to which companies fulfil their reporting requirements naturally varies, in particular as regards the quality of the reports. Some of the smaller companies holding fourth generation COWs have kept their reporting to a minimum.

Further processing

89. According to the COWs of the third and later generations, the company is obliged to assist the Government in achieving the establishment of downstream metals processing facilities in Indonesia if it is economically and practically feasible to do so. If downstream processing facilities are established in Indonesia by a party other than the company holding the COW, that party is permitted to purchase the product of the COW holder at the most favourable price given by the company to any other purchaser. While this condition has not really been tested in practice, commercial circumstances having largely determined the extent of further processing that is carried out, the Government appears determined to enforce it as strongly as possible.

Sales and export conditions

90. While the company has the right to export its products freely, it also has to endeavour to fulfil the requirements of the domestic Indonesian market. It has to sell its products in accordance with generally accepted international business practices, at the best prices and on the best terms compatible with world market conditions. It is not allowed to enter into any sales contract for a period exceeding three years without the prior approval of the Government, and sales to affiliates have to be made at prices based on or equivalent to arm's length sales.

Imports of equipment and supplies

91. The company may import into Indonesia capital goods, equipment and other items needed for the exploration or mining activities free of import duties. Payment of Value Added Tax (VAT) on such items is postponed until the start of operations. This relief from import duties and VAT only applies, however, to the extent that the imported goods are not produced in Indonesia and available on a competitive basis. Items imported may be re-exported or sold on the domestic market, in the latter case after payment of import duties and VAT.

Taxes and royalties

92. Investors are subject to the following taxes:

(i) Deadrent in respect of the contract or mining area;
(ii) Royalties on production (these generally correspond to less than 5 per cent of value of the product; for silver and gold, a progressive rate going from 1 to 2 per cent is levied);
(iii) Additional royalties on exported minerals (also very low and in some cases not levied if the mineral is processed);
(iv) Income tax on profits (35 per cent, exploration and other pre-production expenses as well as losses can be carried forward, interest on debt is deductible provided that the debt/equity ratio is not above 3:1 (8:1 in "frontier" areas, or 5:1 if the investment is less than 200 million US dollars));
(v) Personal income tax (not levied on "fringe benefits" of employees such as free housing etc.);
(vi) Withholding taxes on interest, dividends and royalties;
(vii) VAT (10 per cent) on purchases and sales of taxable goods;
(viii) Stamp duty on legal documents;
(ix) Import duty on goods imported unless exempt from import duties (see above);
(x) Land and building tax (0.1 per cent of the assessed value, but paid at a reduced rate in "frontier" areas);
(xi) Taxes charged by regional governments and approved by the national government;
(xii) Administrative fees and charges and tax on the transfer of ownership of motor vehicles and ships.

93. The reason for specifying in the contract all the different taxes to be paid is that the conditions established in the COW are valid over the life of the project regardless of subsequent changes in taxation. [2]

Repatriation of funds

94. The company has the right to freely transfer abroad in any currency funds corresponding to net operating profits accruing to the foreign investor, repayment of principal and interest on loans, depreciation of capital assets, proceeds from sales of shares, expenses for expatriate personnel and for training of Indonesian nationals abroad and compensation in case of nationalization of the company. This provision is in line with the Government's general policy on allowing free capital movements.

Change of business or ownership

95. The company and its shareholders may not, without the Government's approval, amend the Articles of Incorporation of the company, change the basic nature of its business, voluntarily liquidate it, merge or consolidate the company with any other

company or guarantee or otherwise pledge the minerals in the contract area. This provision is intended to give assurance to the Government that it will be able to protect the country's interest in dealing with a credible company. It is particularly important in the case of the many relatively small companies prospecting for gold.

Divestment of shares

96. Shares owned by the foreign investor have to be offered to Indonesian interests, with the Government having the right of first refusal, after the fourth year of operation. Successively increasing target percentages for Indonesian ownership (including that of any original Indonesian partner) have to be met from the end of the fifth year after the start of operations. At the end of the tenth year, the Indonesian ownership should be 51 per cent (45 per cent in the case of "frontier" COWs). It should be noted that this provision was not included in the first generation of COWs and took the form of an option on the part of the Government in the second generation. Consequently, Freeport acquired a partner (the Indonesian Government) holding 10 per cent of the shares only when its first generation COW was revised and changed to a fifth generation COW, and International Nickel Corporation only acquired Indonesian participation in 1990, when 20 per cent of the shares were sold on the Jakarta Stock Exchange, the Government having had no interest in exercising its option earlier. The rules concerning the valuation of the shares to be divested appear to take the interests of the foreign investor adequately into account.

Employment practices

97. The company has to employ Indonesian personnel to the maximum extent consistent with efficient operations. It also has to carry out a comprehensive training programme for Indonesian personnel. The company may bring expatriate personnel to Indonesia to the extent required, in the company's judgement, to carry out the operations efficiently.

Land rights

98. The COW takes precedence over any existing land rights. Procedures for payment of compensation to land owners and resettled local people are relatively uncomplicated and the Government assists in carrying out any resettlement.

Social services

99. The company is expected to furnish free medical care to its employees and, if a permanent settlement is established, also to government officials. The establishment of a permanent settlement also entails the obligation on the part of the company to provide free primary and secondary education to the children of employees. In practice, medical and education facilities established by companies are also open to local non-employees and their families.

Infrastructure

100. The company should endeavour to assist in maximizing the economic and social benefits generated by its operations by coordinating any such benefits with local and regional infrastructure studies as well as assisting and advising the Government in its planning of infrastructure and regional development. In particular, the company has to allow the public and the Government to use any infrastructure constructed by the company, such as roads, harbours and air strips. Such infrastructural investments may be of considerable importance to the local and regional economy and are considered by the Government to be among the main benefits of mineral sector activity.

Local business development

101. As part of the feasibility study, the company has to prepare a Business Development Programme. This programme should aim to make provision for local sub-contracting of services such as construction, maintenance, retail trade, provisioning of supplies and personal services. The programme should also include training of local people to enable them to undertake these tasks. The success of the programme depends on the characteristics of the region, in particular the size of the local population and the level of economic development of the area.

Environment

102. An environmental impact assessment has to be included in the feasibility study. Companies with earlier COWs were given until the end of 1992 to submit environmental impact assessments. [3]

Settlement of disputes

103. Conciliation and arbitration of disputes between the parties to the COW take place in accordance with the UNCITRAL (United Nations Commission on International Trade Law) Conciliation Rules and Arbitration Rules. Tax disputes are, however, subject to the jurisdiction of the Consultative Board for Taxes. Conciliation or arbitration proceedings are held in Jakarta, unless the parties agree otherwise. The language of the proceedings is English.

B. Discussion

1. The investors' point of view

104. Conditions for foreign investment in the mineral sector in Indonesia have been favourable compared to the situation in most developing countries since the first generation of COWs was negotiated, as evidenced by the considerable interest shown by international investors. From fiscal year 1986/87 to 1990/91, companies holding COWs

invested 818.8 million US dollars in Indonesia. [4] Particularly attractive from the foreign investor's point of view has been the immunity of COWs to subsequent changes in legislation and the fact that since the COWs are adopted by parliament, they clearly supersede other government regulations. It has, of course, to be recognized that this immunity would have been considered less valuable if it had not been for the general economic and political stability of Indonesia as perceived by investors. In other developing countries, mining agreements have been signed by Governments and approved by parliaments, only to be changed when a new government comes into power or the parliamentary majority changes. Nevertheless, it is clear from discussions with investors that the stability of conditions, more than the conditions themselves, is what has created the perception of Indonesia as having a good investment climate. The standardization of COWs within each generation is also recognized as an advantage, since it reduces the time and effort spent in negotiations.

105. Conditions have, however, changed between successive generations of COWs. Requirements for Indonesian participation have become more demanding, probably as a result of the economic growth and transformation process, which has made such participation an increasingly realistic option. Experience from, in particular, fourth generation COWs has also led the Government to strengthen the requirements as regards the financial commitment of the companies concerned, in order to have some assurance that the companies have the necessary financial means to develop any deposits found.

106. As regards the financial conditions for foreign investment, comparisons with other developing countries show that regulations concerning taxation in Indonesia are relatively favourable, although not more so than in other countries that have succeeded in attracting significant foreign investment in mining. [5] The same applies to regulations concerning repatriation of profits, imports of equipment and other regulations pertaining to financial conditions. The only disadvantage from the investor's point of view is the requirement for a phased divestment of shares in favour of domestic investors, which has the effect of reducing the degree of control that the foreign investor can exercise.

107. A positive investment climate for the mineral sector is not, however, simply a function of financial conditions. A geology considered to be favourable to the occurrence of large and high-grade mineral deposits is obviously a necessary requirement. Indonesia is clearly believed to have favourable geological conditions. It constitutes an additional advantage if the Government is able to facilitate exploration by providing basic geological information in the form of geological maps, geophysical and geochemical data, and information about the results of earlier exploration.

108. Recent budget cuts in the agencies concerned with the provision of basic geological information, together with an understandable emphasis on geological investigations oriented towards disaster prevention, have left these agencies in a situation where they depend largely on external assistance in order to carry out field work. On the other hand, the requirements written into the COWs concerning the provision of geological information from explorers and mine operators, as well as the efforts made to establish databases and publish geological information, show that the Government is making efforts to ensure that data are widely available.

109. Speed and clarity of legal and administrative procedures are also important factors for an attractive investment climate. This includes aspects such as the time needed to obtain permits, whether procedures are clear and appropriate and whether they remain stable. As regards the appropriateness of the legal framework, it can be noted that there is a certain "speculative" demand for mining authorizations from small companies that do not plan any real exploration work. Instead, they hope that the area in question will eventually become of interest to a foreign company, in which case they will be able to exchange their mining authorization for a partnership in the COW. This speculation is possible because of the relatively limited work obligations associated with ordinary mining authorizations. The division of authority between the central and provincial governments has in a number of cases led to overlapping authorizations. The resulting conflicts have generally proved easy to settle, and the basic mining law provides consistent guidance on this point.

110. The aforementioned budget cuts have, however, of necessity affected the level of service provided by the Government as well as the degree of control it can exercise. The time needed to obtain authorizations has increased, reporting requirements are enforced less rigorously than in the past, and the frequency of mine inspection visits has decreased. In order to retain investor confidence it is important to ensure that applications are dealt with speedily; the Government is taking steps in this direction, *inter alia*, through the computerization of registers of mining rights.

111. A final area where clarity of regulations and government support to the industry are important is environmental protection. As already mentioned, COWs of later generations contain provisions for environmental impact assessments. One problem is the lack of established standards as regards emissions from mining and metallurgical activities and the variations in practice between different parts of the country. Another problem is the lack of experience on the part of government authorities in evaluating assessments. This is the case in particular with regard to the sociocultural parts of the impact assessment, which are particularly important in Indonesia's multicultural society. An ambitious programme aiming at training large numbers of staff is, however, under way.

112. As regards the future direction of Indonesian policy towards foreign investment, it would appear that the case for special conditions for foreign investors is growing weaker as the economy develops and as domestic companies mature. The success of other export industries and the easing of the external debt situation may also in the long term have the effect of reducing the premium on export income generated by the mining industry. It might then not be as necessary to rely on foreign companies to carry out mineral development projects. It seems clear, however, that it will take a long time before private domestic companies acquire the necessary financial strength and know-how to finance and implement major investment projects. Meanwhile, it would seem that some concessions will be given to foreign investors in order to ensure the development of large deposits. The need to promote investment in the eastern part of the country has in the past few years provided the justification for some preferential taxation treatment for mining, as far as foreign companies are concerned.

2. Government objectives and experience

113. Two important government objectives which have played a role in policy formulation as regards foreign investment in mining are the maximization of export revenue and of government income.

114. It is probably correct to state that maximization of export income is the government's primary objective with regard to the non-fuel mineral sector. The sector's contribution in this regard has been important and has contributed to the largely successful restructuring of the external debt in a period when income from the major source of export proceeds, the oil and gas sector, was falling. The main instrument used to achieve this has been the promotion of foreign investment through the use of COWs. While the state-owned companies also play an important role in this context, the provision of capital and technology by foreign companies has been crucial. The attractiveness of this method from the Government's point of view is that the capital brought in by foreign mining companies is additional and does not deprive other sectors of investment funds. Furthermore, in a country such as Indonesia, which lacks a long history of most types of mining, technology will probably have to be brought in through foreign investment.

115. The objective of maximizing government income from the non-fuel mineral sector appears to have had lower priority in Indonesia than in many other developing countries, possibly because of the limited importance of this sector in terms of public sector income. State revenue from COWs increased from about 13 million US dollars in 1985 to about 85 million US dollars, or slightly less than 1 per cent of total public revenue, in 1990. As a comparison, revenue from state mining companies increased from 16 to 70 million US dollars over the same period. [6] The Government is aware of the need to place constraints on the income maximization objective if foreign investment is to be attracted. For instance, the tax on windfall profits, introduced in the third generation COWs, was abolished in those of the fourth generation, following a disappointing fall in foreign investment. The royalty system provides for payments which do not appear excessive compared to conditions in most developing countries (this is not necessarily the view taken by mining companies, in particular with regard to royalties on non-metallic minerals). Nevertheless, it should be observed that there appears to be a general movement in developing countries with a large mineral sector away from gross revenue-related taxes in the direction of taxes related to profits, [7] and so Indonesian royalties may have to be reviewed against this background.

116. As regards the disposition of the revenue obtained, percentages of royalties and land rent are shared in the proportion of 20:80 between the central and provincial governments, while the provincial government gets 90 per cent of the Land and Building Tax. It is left to the provincial government to decide how much is distributed to lower government levels. The central government keeps the other revenues. It would appear that one potential source of friction between local and central government authorities, and one which in other countries has led to serious problems, has been eliminated through these measures.

117. No special policies have been pursued with regard to the use of government income

received from the mineral sector. Two main arguments can be advanced in favour of "earmarking" income from this source for particular uses. The first is that variations in income, together with a limited absorption capacity of the national economy, may give rise to problems in maintaining macroeconomic equilibrium. For this reason, some countries, for instance Papua New Guinea, have established stabilization funds which are insulated from the national economy and cannot be used for ordinary government expenses. These funds are built up when incomes are high and drawn down when specific, defined needs arise, either for investment or to compensate for shortfalls in export income. In view of the limited macroeconomic importance of the Indonesian non-fuel mineral sector, this argument does not appear to be applicable. A second, somewhat related argument, is that since mining entails the depletion of a natural resource perceived, as in Indonesia, as a national asset, income from the process should be earmarked for investment in new assets in order to keep intact the national capital stock. In the case of Indonesia, the contribution of export income to making possible the restructuring and payment of external debt can be said to have served the same purpose.

118. Other objectives have clearly also been important to the formulation of policy with regard to foreign investment. In 1990, the Director General for Mines identified the following four primary outcomes expected from foreign companies engaged in the mineral sector: regional development, manpower development and transfer of know-how, promotion of local content, and promotion of value added. [8]

119. The emphasis on regional development is reflected in the COWs. In the Government's view, mining projects should stimulate local development in particular by providing infrastructure and opening up areas to more intensive agriculture. This is the case in particular in the transmigration areas. While the contribution from large-scale mining to local and regional development may be relatively limited, given the concentration of mineral development projects to small, well-defined areas, it represents resources that are additional to the support provided by the Government directly. The conditions for investment in less developed parts of the country, in particular the eastern parts, have therefore been made more attractive. Through specific provisions in the COWs, the Government is also attempting to maximize the beneficial impact on the local economy of mineral development. These include provisions for assistance by the investigating company to local industry and other economic activities.

120. As of yet, the attempts to stimulate regional development have not gone in the direction of trying to establish zones of industrialization based on mineral sector activities, largely because of the limited local markets and the absence of commercial infrastructure.

121. The Government's efforts to promote mineral exploration and investment in the "frontier" areas under the present generation of COWs have yielded results in terms of exploration activity. Table 17 shows the areas granted to holders of COWs in the different parts of Indonesia, and provides an idea of the extent, if not the intensity, of development work in the different regions.

122. It is difficult to estimate the impact that major mining projects have had on regional and local economies without making an in-depth analysis of the experience in the regions, particularly Irian Jaya and Sulawesi, where the large projects are located. The readily

available information is limited to anecdotal data. It does, however, permit a distinction to be made between the two regions mentioned.

123. From discussions with government officials as well as representatives of the companies concerned, it appears that improvements can be seen in Sulawesi, in terms of both increased local income from mining and economic activity overall, in particular in agriculture (the high iron content of the soil in the area surrounding the mine makes the land unfertile, so the increased local demand for food has mainly benefitted farmers in areas at some distance from the mine). Living standards have also increased considerably, partly as a result of the compensation to landowners, in accordance with the wishes of the local people, having been paid in kind (equipment, cement, etc.) rather than in money.

124. In Irian Jaya, on the other hand, Freeport's operations have had relatively less impact. The extent to which it has been possible to recruit a workforce among the local population has been smaller, although the company has instituted a training programme, and, consequently, the share of employees from other regions and of expatriates is higher. [9] The relatively undeveloped state of local agriculture has also meant that food has had to be brought in from other parts of the country. Finally, the absence of any other economic activities that could use the infrastructure established for the mine has limited the positive economic effects. As regards the gold mining projects recently opened or under development, it is still too early in most cases to make an assessment.

Table 17. Proportion of the area of the main islands of Indonesia covered by Contracts of Work (COWs) in 1990, per cent of total area

Island	General survey, exploration	Feasibility study, construction, production
Kalimantan	27.4	0.4
Sumatra	21.7	0.1
Sulawesi	68.4	1.2
Maluku	53.8	0.0
Irian Jaya	60.1	0.02

Source: R. Wiriosudarmo: The Development of Mineral Industry in Indonesia. Paper presented at the UNCTAD/ESCAP Seminar on Minerals, Metals and Economic Development in the Asia/Pacific Region. (Perth, Australia, 28 May to 1 June 1990).

125. As regards manpower development and transfer of know-how, the COWs require foreign investors to maximize the employment of Indonesians within the limits of practicality and efficiency. The two major foreign investors, Freeport and Inco, have successfully reduced the portion of expatriate employees to 10 and 1 per cent, respectively. Another example, although it is not operating under a COW, is the Asahan

aluminium smelter in Sumatra, where all personnel except the company president are Indonesian. Table 18 shows the situation for all COW holders in 1985 and 1990. The proportion of Indonesians is generally very high and has increased for all categories of employees except at the level of management. The decrease in the share of Indonesians at the management level can probably be attributed to the large number of new (fourth generation) COWs in the late 1980s. Work under most of these COWs has not progressed beyond the exploration stage.

Table 18. Share of Indonesian personnel (per cent), for all COW holders

Category	1985	1990
Management	70.8	60.5
Professional	87.3	91.1
Foremen	88.1	92.7
Administration	98.8	100.0
Clerks	100.0	100.0
Skilled workers	92.8	94.7
Unskilled workers	100.0	100.0

Source: K. Gandataruna: Indonesian Mining status and goals for the Nineties (in Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993)

126. Whether the attempts to encourage purchases of inputs on the domestic market have had any major effect may be disputed since companies have been allowed to resort to imports whenever domestic products were unavailable on competitive terms. As seen in chapter II (section C.2), however, the import content of purchases was relatively low already in 1985. Since then, production of manufactures in Indonesia has increased dramatically. As the Indonesian manufacturing sector becomes more diversified and as the liberalization of trade policy continues, it becomes ever more likely that Indonesian products can be supplied on competitive terms.

127. The Government is also determined to increase the degree of processing in the mineral sector. The domestic market for processed minerals and metals is growing as a result of the increase in production of manufactured goods, and the proportion of processed minerals and metals production sold domestically is on an upward trend. Indeed, growing domestic consumption was one of the arguments used by the Indonesian Government to support its demand for a change in the production-sharing arrangements for the Asahan aluminium smelter. [10]

128. As regards copper, following several years of discussions between the government and Freeport, construction of a smelter/refinery complex is now under way. The viability of the project depends on international market conditions, since domestic consumption of refined copper, although increasing, will not absorb the entire production.

129. It is worth noting that whereas semi-fabricates production has mostly been established without any direct intervention by the Government, expansion of processing capacity at earlier stages, as in the cases of copper and of alumina/aluminium, requires large amounts of capital and it is therefore necessary for the Government to engage itself in the decision-making and investment process. The particular provisions concerning downstream processing in the COWs are unlikely to have been of major importance in this regard, although they serve as an expression of the Government's objectives. [11] It is noteworthy that the attempt to introduce stronger provisions regarding further processing had to be abandoned (see paragraph 85 above).

130. In summary, with regard to the objectives stated in paragraph 118 above, it appears likely that government policy has significantly affected the outcome of foreign investment as far as regional development and manpower development, and possibly also the use of local inputs, are concerned. It is more difficult to identify any direct impact on the use of local inputs in mining and on downstream processing, where developments might have followed the same course without government intervention.

Notes

1. For a review of contracts concluded with foreign investors in coal mining, see J.M. Otto: Indonesian coal model contract and coal in developing nations, Raw Materials Report, Stockholm, Vol. 9, No. 2, 1993.

2. See R. Mansury "Mining Taxation in Indonesia" (in United Nations Economic and Social Commission for Asia and the Pacific and United Nations Development Programme Minerals Industry Taxation Policies for Asia and the Pacific, New York, 1992), for a detailed description of tax regulations concerning mining in Indonesia.

3. For a description of environmental regulations applied to the mineral sector in Indonesia, see UNCTAD Environmental legislation for the mining and metals industries in Asia (UNCTAD/COM/40), Geneva, December 1993.

4. Figure according to the Department of Mines and Energy of Indonesia.

5. See Coopers & Lybrand: Mining Taxation - A Global Survey, Washington D.C., 1990, for details of tax legislation concerning mining in a large number of countries. A comparison in P.J. Shah: Indonesian Comparative Advantage in Mineral Investment (in Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993) shows that tax regulations in Indonesia are about as favourable as those of Brazil, Malaysia, Papua New Guinea and Zambia.

6. K. Gandataruna: Indonesian Mining Status and Goals for the Nineties (in Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993).

7. This emerged as a general conclusion at the International Seminar on Mining Taxation organized by the United Nations Department of Technical Cooperation for Development and the Canadian Institute of Mining, Metallurgical and Petroleum Engineering in Montreal, Canada, from 30 September to 4 October 1991.

8. K. Gandataruna: Indonesian Mining Review, Department of Mines and Energy, Jakarta, 1990.

9. In 1992, less than 14 per cent of Freeport's employees were Irianese (K. Gandataruna: Indonesian Mining Status and Goals for the Nineties, in Indonesian Mining Association: Indonesian Mineral Development 1992, Jakarta, 1993).

10. Far Eastern Economic Review, Hong Kong, 13 October 1988, and Japan Metal Bulletin, Tokyo, 1 October 1988.

11. With regard to bauxite and aluminium, the possibility of establishing an alumina refinery close to the bauxite mines has been considered by the Government from time to time. Since the alumina market was in oversupply until 1989, it appears to have been relatively easy to obtain deliveries of alumina for Asahan smelter on comparatively good terms. While alumina prices increased in the period 1989 to 1991, they have fallen since then. The recent and planned expansions of alumina production capacity in Australia, and the possibility of obtaining good conditions for supply of alumina from that country, would also have to be taken into account when a decision is made. Expansion of alumina production capacity in Australia in the period 1990 to 1992 corresponded to an addition of 1.4 million tons per year. Further expansions of capacity corresponding to between 630 and 900 thousand tons per year were planned for 1993 and 1994 (UNCTAD: Market situation and outlook for bauxite, alumina and aluminium, TD/B/CN.1/BAUXITE/2, Geneva, January 1993). While domestic bauxite production over the past few years has been sufficient to supply an alumina refinery utilizing full economies of scale (it is generally considered that a new alumina refinery needs to have a capacity of 600,000 to 800,000 tons alumina per year, which implies an annual bauxite consumption of 1.2 to 1.7 million tons), the Asahan smelter needs only about 450,000 tons alumina per year. Consequently, a large proportion of the alumina production would have to be sold on the world market, where it would compete with production from other countries, in particular Australia. The absence of other aluminium smelters in the region increases the risks of the project, although there are preliminary plans for the construction of an aluminium smelter with a capacity of 120,000 tons aluminium per year in the state of Sarawak in Malaysia (American Metal Market, New York, 5 November 1990), which would be a natural market from the point of view of transportation costs.

IV. OTHER MINERAL SECTOR POLICIES AND PROBLEMS

131. The Indonesian Government has mainly relied on foreign investment to realize its objectives with regard to the non-fuel mineral sector. With the exception of the state owned companies, the domestic industry has played a modest role. As the economy develops, however, the private domestic sector is likely to gain increasing importance.

132. Domestic mining companies, with the exception of the state owned ones, are still small. These companies are often family owned firms which have acquired their financial stake in other businesses and have diversified into mining. Conditions for investment by domestic companies are significantly less attractive than those for foreign investors. Domestic investors do not benefit from any immunity to subsequent changes in legislation, nor are the other conditions for their investment as attractive as they are in the COWs. They receive the same treatment as domestic investors in other sectors with regard to taxation, imports and capital movements. Given the high real interest rates and an abundance of business opportunities resulting from deregulation, private mining companies find it difficult to raise the funds needed for development of deposits and for investments in processing. Although there is no information implying that the rate of return on capital in the mineral sector is lower than in other sectors, the high risks involved make it difficult to obtain funds from the banking system. Commercial banks do not lend to mining projects. A special provision whereby 20 per cent of bank lending has to go to small enterprises is of no help in this regard, since the investment is limited to only 600 million rupiah (about US$ 300,000). The Indonesian Development Bank (BAPPINDO) makes loans only for capital equipment but has lent very little to mining companies since they find it difficult to provide collateral. (The fact that ordinary Mining Authorizations are conditional on the fulfilment of reporting and other requirements probably bars them from being acceptable as collateral). There appears to have been no discussion of the possible need for a special bank to finance small or medium-scale mining. Sometimes, however, mining companies form joint ventures with other companies so as to raise collateral. Introduction on the stock exchange is not a realistic alternative for most of the companies concerned, in view of their small size. It is interesting to note, however, that demand for geological and other exploration services from the private sector has increased, and that this increase is attributed to the fact that the stock exchange provides a source of risk capital. [1]

133. Probably as the banking system and the private capital market develop, finance for investment by domestic mining companies will become easier to obtain. Nevertheless, finance for investment in the mineral sector everywhere in the world comes either from international banks, which will consider only very large projects, or from funds generated within the companies themselves. Thus, the private Indonesian companies will themselves have to generate a large portion of the investment funds needed. Recent developments, with companies from Japan, the Republic of Korea and Taiwan Province of China entering the non-metallic mineral sector, which normally would have been considered the domain of domestic companies, may be the first sign of a trend resulting from the scarcity of investment funds in the domestic mining industry in Indonesia.

134. In the Government's view, mining projects should stimulate local development,

particularly by providing infrastructure and opening up areas to more intensive agriculture. This is the case especially in the transmigration areas. As was seen earlier from the description of conditions in the COWs, these include provisions for assistance by the investing company to local industry and other economic activities. Furthermore, a "foster father" scheme, introduced in 1989, which requires state-owned companies to set aside 1 to 5 per cent of net profits after tax for assistance to small scale industry has similar objectives. All state companies have the status of "development agents", which means that they can be called on by the Government to assist in development programmes. While it could be argued that a degree of financial support from the Government with regard to the financing of infrastructure could enlarge the stock of viable mineral development projects and thus increase the benefits to less developed regions, budget constraints have apparently so far precluded any steps being taken in this direction.

135. The Government is also clearly aware of the potential importance of small-scale mining to local and regional economic development, and a number of measures have been introduced to improve the conditions under which small-scale miners operate.

136. Provisions for small-scale mining or "People's Mining" are included in the basic mining law. These provisions are, however, fairly restrictive; accordingly, a new scheme for small-scale mining, called PSK after its Indonesian initials (*pertambangan skala kecil*), was introduced in 1990. The objectives of the PSK concept are: [2]

> "1. To organize people's mining activities according to orderly, profitable and good mining practices by taking into consideration safety, environment protection and conservation of mineral resources.
>
> 2. To facilitate an institutional structure which is suitable to the aspiration, needs and abilities of the people in carrying out mining operations.
>
> 3. To help bridge the existing gap between economically strong mining operations and the efforts of the people to make a living by mining ore deposits.
>
> 4. To facilitate linkages with the Government and the mining industry to assist the people in developing mineral resources.
>
> 5. To create harmonious conditions amongst various interests in the mining industry as well as other industries in achieving the objectives of national development.
>
> 6. To promote the prosperity of the people by avoiding the possible exploitation of the people by irresponsible stronger parties.
>
> 7. To facilitate education for the people to allow them to appreciate technology."

137. Organizationally, PSK has been linked to the village cooperative units, known as KUD (koperasi unit desa), of which there are about 7,400 in Indonesia. The KUDs are responsible for the distribution of fertilizer and rice seeds as well as for the supply to

villagers of basic daily needs such as sugar, salt and clothing. Several of them have set up small-scale enterprises in areas such as food processing. Under the PSK scheme, the KUDs get their mining authorization directly from the Department of Mines and Energy, instead of from the provincial governments as is otherwise the case for People's Mining. They are granted an Exploitation Mining Authorization which cannot exceed 100 hectares in area (as compared with 5 hectares for People's Mining).

138. Mining operations set up under the PSK scheme receive technical assistance from the relevant government departments as well as from state-owned companies and from COW holders. They are also given financial assistance from state-owned companies through the aforementioned foster father scheme. The financial assistance can be used to purchase equipment or as collateral for loans. Aneka Tambang also purchases gold produced by PSK operations under an agreement approved by the Department of Mines and Energy. The PSK operations can also benefit from the special credit schemes in force for rural cooperatives. These credit schemes are, however, planned to be phased out in 1994/95.

139. One of the reasons for introducing the PSK concept was the need to avoid conflicts over mining rights and between local populations and artisanal gold miners, as had occurred in Kalimantan. This is one of the areas where the new scheme appears to have worked. It may yet be too early to attempt an evaluation of the PSK scheme; the scheme has encountered considerable difficulties in implementation, principally owing to the lack of qualified management. [3] Nevertheless, some interesting features of the scheme should be noted. These include the integration of small scale mining operations into an existing economic framework, the provision for technical extension services, and the overall coordinating roles of the Department of Mines and Energy and the Department for Cooperatives. All of these features would seem to be necessary to ensure success of the scheme. Technical extension services, in particular, are likely to be crucial in light of the limited technical and managerial capabilities of most of the small-scale mining ventures. The cuts in the budget of the Directorate General of Geology referred to earlier appear, however, to have resulted in some impediments to the PSK programme.

Notes

1. Information from industry.

2. R. Wiriosudarmo: PSK: The Indonesian Concept of Small Scale Mining. Department of Mines and Energy, Jakarta, 1990.

3. Personal communication from the Department of Mines and Energy.

Annex

Persons interviewed in Jakarta, 21-24 May and 4-7 June 1990, and 21-28 February 1991

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Mr. Rachman Wiriosudarmo, Director of Mining Business Development

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Ministry for Development (BAPPENAS)

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Mr. Halomoan Panjaitan

Central Bureau of Statistics

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Mr. Oloan P. Siahaan, Vice President

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P.T. Inco

Mr. B.N. Wahju, Vice President and Secretary

Mr. Usman Effendi, Director, Government Relations

Freeport Indonesia

Mr. Usman Pamuntjak, President and Director

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Dr. H.L. Ong, Advisor

Mr. M. Simatupang, former President, P.T. Timah, President Director of P.T. Stannia Engineering, Vice President of the Indonesian Mining Association

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ENVIRONMENTAL ASPECTS OF BAUXITE AND ALUMINIUM PRODUCTION IN INDONESIA

A country case study prepared by the UNCTAD secretariat

GE.94-50875

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I. INTRODUCTION

1. The present study is one of a series of country case studies on various commodities prepared within the UNCTAD programme on "Improved Natural Resources Management in the Commodity Sector". The programme consists of a series of activities which are linked together around the unifying objective of achieving a sustainable use of natural resources while maximizing the contribution of the commodity sector to development. The case studies undertaken under the programme have two main objectives:

(a) To formulate, against the background of practical experience, conclusions that can be applied in devising and implementing policies aimed at improving environmental protection and natural resource management in the commodity sector in developing countries;

(b) To raise awareness in commodity importing countries, funding agencies and the international environmental community of the opportunities for, and constraints to improvement of environmental conditions associated with commodity production and processing in developing countries.

2. The present study on Indonesia is one of three on bauxite, alumina and aluminium. The other two countries for which case studies on these commodities are under preparation are Brazil and Jamaica. Information for the study was collected during a mission in August/September 1993. The study attempts to:

-identify the environmental effects of bauxite and aluminium production in Indonesia,

-describe present technical and regulatory measures aimed at dealing with these environmental effects,

-evaluate the effectiveness of these measures, and

-draw conclusions which may allow generalizations that could be of use to other countries.

II. BAUXITE AND ALUMINIUM PRODUCTION IN INDONESIA

1. Technology

3. Bauxite is the main raw material used to produce aluminium. It is composed of one or more aluminium hydroxide minerals and impurities of silica, iron oxide and titanium. Grades of bauxite and their different applications are determined by the percentages of alumina, silica, titania and iron they contain. A high alumina content is desirable in practically all uses of bauxite. At least 80 per cent of world bauxite production is from surface mines, with the rest, mainly in southern Europe, the former USSR republics and Hungary, from underground mines. On some surface deposits there is no overburden, while on others the bauxite may be covered by more than 70 meters of rock and clay. Deposits that are hardened may require blasting in order to release the ore. Once the bauxite is loosened into manageable pieces, it is crushed and washed. Unlike base metal ores, bauxite does not require complex processing because most of the ore mined is of an acceptable grade or can be improved by a relatively simple process of removing clay. This is done by some combination of washing, wet screening and cycloning, or even by hand picking and sorting. The bauxite is sometimes dried before shipping.

4. Bauxite is converted to alumina (aluminium trioxide) through the Bayer process. In this process, concentrated caustic soda is used to extract alumina from bauxite at elevated temperatures and pressures. This produces a slurry which consists of a super-saturated aluminate solution and a solid phase commonly called red mud or bauxite residue. This residue is separated from the saturated aluminate solution, which is cooled and seeded to induce crystallization and precipitation. The crystals generated from precipitation are washed and calcined to remove water.

5. Primary aluminium is produced by electrolytic reduction of alumina using the Hall-Héroult process. Alumina is dissolved in a molten cryolite bath and electrolysed in a reduction cell by direct current. Cells are connected in a series and comprise a carbon cathode insulated by alumina or refractory bricks inside a steel shell. Carbon anodes are suspended from above the cells. A direct current passes from the carbon anode through the bath to the cathode. Liquid aluminium is deposited at the cathode in the bottom of the cell and oxygen combines with the carbon anode. Alumina is added to the molten bath and dissolves as the electrolysis proceeds. Fluoride compounds are also added to the bath as required to replenish material removed or consumed. Molten aluminium is periodically withdrawn from the cell by vacuum suction.

2. Bauxite and aluminium in Indonesia

6. The bauxite/aluminium industry in Indonesia consists of two operations: P.T. Aneka Tambang's bauxite mine on Bintan Island, and P.T. Indonesia Asahan Aluminium's (Inalum) smelter at Kuala Tanjung on Sumatra [1].

2.1. Bauxite

7. Aneka Tambang is a state owned mining company which produces several different minerals and metals, including nickel, gold, silver and bauxite.

8. Bauxite mining started on Bintan Island in 1935, during the colonial period. Following independence, the operations were nationalized. Bintan Island is situated south of Singapore and is part of Riau province. Mining takes place on two different concessions, one of 2 392 hectares near Kijang, where the port, capable of taking ships up to 40 000 tons, is located, and one of 5 630 hectares close to Tanjung Pinang, about 25 kilometers from Kijang. Bauxite from the latter area is brought to Kijang in barges after crushing and washing. There is no drying process, and the bauxite is exported wet.

9. The bauxite deposits are relatively flat, about three meters in thickness with little or no overburden, mainly a thin layer of topsoil. Mining also takes place in shallow water during low tide (there is a two meter difference between high and low tide). About 500 hectares have been mined, and on average 35 to 40 hectares are mined per year at present. The bauxite is of the gibbsite type, with the deposits having an average alumina content of 40 to 45 per cent. The average alumina content of the exported bauxite is 50 per cent. Production was between 500 000 and 1 million tons per year in the 1980s (see table 1). In recent years it has been close to 1.3 million tons. The determining factor is the capacity of the washing plant. The bauxite is mainly exported to Japan under a five year contract with prices linked to aluminium quotations at the London Metal Exchange. Some bauxite is also exported to the Republic of Korea under a long term contract expiring in 1996[2]. The mine shows a modest profit. The operations employ around 800 people permanently, of which 400 in the mine, and about 450 on a temporary basis for loading, exploration and reclamation. The mine introduced a third shift in 1993. Most of the employees are from Bintan Island.

10. Reserves are sufficient for seven to eight years' production at the current rate of mining. Aneka Tambang is at present exploring for bauxite in Kalimantan. The possibility of establishing an alumina refinery close to the mine has been under study for several years. The establishment of a refinery on site would allow the mining of lower grade bauxite reserves. At present, the future of the refinery project depends, inter alia, on the results of the exploration campaign in Kalimantan.

2.2. Aluminium

11. Inalum's aluminium smelter is located at Kuala Tanjung, on the eastern coast of Sumatra, about 120 kilometers southeast of Medan. The smelter began operations in 1982. Its production capacity is 225 000 tons per year. The smelter has however never reached full capacity utilization, due to a shortage of electrical power (see below). In most years, production has been about 200 000 tons. In the summer of 1993, the smelter operated at about 80 per cent of capacity, with parts of two potlines (out of three) closed down.

12. The company is owned 41.13 per cent by the government, with ownership exercised by the Department of Industry, and 58.87 per cent by Nippon Asahan Aluminium Co. Ltd., a consortium of several Japanese companies with interests in the aluminium industry. The present ownership shares reflect an agreement made in 1987, when the financial package for the smelter was changed. Before that, the government held 25 per cent of the equity, and Nippon Asahan 75 per cent[3].

13. Like almost all aluminium smelters built during the 1980s, the smelter is of the prebaked anode type, which has advantages both from the point of view of production economy, in particular energy efficiency, and environmental impacts, over the older, so called Söderberg technology. It was built using Japanese technology from Sumitomo. The operations consist of the potroom, where the electrolysis of alumina is carried out, a cast-house, where the molten aluminium is poured into ingots, an anode production facility, where petroleum coke and pitch are combined and baked to form the anodes used in the electrolysis, a power transformation plant, and a port capable of taking ships up to 20 000 tons. Outside the operations area itself, and managed by a different company, are the facilities for constructing cathodes of refractory brick and pitch. The spent cathodes are broken up in the same facilities.

14. The smelter is supplied with electric power from the company's own two hydro power stations, which are located on the Asahan River, close to Lake Toba, about 100 kilometers from the smelter. The power stations have not been able to deliver the planned amount of power since they started operations, due to the unstable water level in the lake. While annual rainfall is sufficient, runoff from the mountains surrounding the lake varies more than expected. It is believed that the larger than expected variations in runoff result from large scale logging having taken place on the mountainsides. The company is considering plans to add a third power station, which would yield another 120 Megawatts in addition to the 500 Megawatt nominal capacity of the existing stations. A small amount of electric power, about 10 Megawatts, is transferred to the government network.

15. Alumina is imported mainly from Alcoa of Australia's refineries in Australia, with additional quantities coming from India. 60 per cent of the smelter's production goes to the members of the Nippon Asahan consortium, under an agreement made in December 1988, following negotiations over the division of production[4]. The rest goes to the domestic Indonesian market.

16. Due to the difficulties of reaching full capacity utilization, Inalum has had losses in most years since its establishment. The smelter employs about 2 300 people, of whom most are from the surrounding countryside.

2.3. Economic importance of bauxite/aluminium production

17. Table 1 summarizes production and export data for bauxite and aluminium in Indonesia. Both in absolute terms and as a percentage of total exports, the exports peaked in 1988, when aluminium prices were very high, and exports reached 1.6 per cent of total merchandise exports. Due to lower aluminium prices and the rapid growth

in overall Indonesian exports, the share of total exports has since fallen to around 0.5 per cent. Thus, although significant, bauxite/aluminium exports do not constitute a major share of Indonesian export earnings. The industry's contribution to GDP, government income and employment is lower, in particular given the capital intensive nature of the production.

Table 1 Bauxite and aluminium production and exports

Year	Bauxite		Aluminium	
	Production (thousand tons)	Exports (million US dollars)	Production (thousand tons)	Exports (million US dollars)
1981	1203.0	12.4	-	-
1982	704.0	11.1	32.5	21.3
1983	778.0	11.8	114.8	128.8
1984	1003.0	12.8	199.0	204.4
1985	831.0	9.0	216.8	259.3
1986	650.0	6.7	218.8	194.2
1987	635.0	7.3	201.4	237.9
1988	518.0	5.6	185.1	302.1
1989	862.0	10.8	196.9	290.8
1990	1206.0	11.3	192.1	202.8
1991	1406.0	14.9	173.1	161.6
1992	1350.0	14.4	180.0	155.7
1993	1350.0	13.2	180.0	143.1

Source: UNCTAD: Commodity Yearbook (1981-91), estimates by UNCTAD secretariat (1992-93)

III. EFFECTS ON THE ENVIRONMENT OF PRODUCING AND PROCESSING BAUXITE AND ALUMINIUM[1]

1. Bauxite production

18. The potential environmental impacts associated with bauxite mining may be categorized into those impacting on the physical and natural environment and those having a socio-economic impact. The former are concerned mainly with air and water pollution, noise, solid waste, land disturbance, changes in natural ecosystems and aesthetic aspects such as visual disamenity and other nuisance. Air pollution problems are relatively insignificant in bauxite mining, and relate mainly to dust. Problems regarding water pollution and solid waste are also less serious than in base metal mining in general, since the process water is not acidic and since the tailings do not contain toxic elements. If released in water courses, the tailings are however detrimental to marine life, since they cover sea and river bottoms and contain no nutrient elements. Since bauxite deposits are often shallow and cover a large surface, mining often occupies a large area and results in significant changes to ecosystems. On the other hand, mined out areas are relatively easy to restore.

19. Socio-economic impacts are concerned mainly with the whole range of impacts on the human socio-cultural system, as well as on other areas of economic activity. Most importantly, since bauxite mining often uses large areas of land, conflicts with other land uses may occur[2].

1.1 Impacts on the physical and natural environment

20. Bintan Island, where Aneka Tambang's bauxite mine operations are located, has a tropical climate with high rainfall (about 2000 millimeters per year) distributed relatively evenly over the year with a minimum in February of 89 millimeters and a maximum in December of 212 millimeters. The island has no accessible ground water, and there is a shortage of fresh water. The soil consists of laterites not very well suited for agriculture. The original vegetation has to a large extent been cleared away and replaced by low forest and shrubland. In most places along the coastline, there is a narrow belt of mangroves.

21. The environment management report for the bauxite mine was approved in 1992. An environmental impact assessment for an alumina refinery on the island has also been prepared and approved. A monitoring plan is under preparation. Inspections are carried out by the Department of Mines and Energy every three months.

22. Before mined out areas are revegetated, the ground is first plowed to improve its permeability, since the there is a relatively impermeable layer of kaolinite below the bauxite. Revegetation is carried out by digging holes which are filled with topsoil and natural and chemical fertilizer, and planted with trees. Mainly species that are not native to the island are used, in particular acacia magnum. No attempt is made to restore topsoil between the holes dug for trees. The trees grow quickly, and reach a height of about four meters within two years. The visual impact of mining is thus

eliminated very soon after operations have finished in a particular area. While the original ecosystem is not restored, the ecosystem existing before mining was already affected by logging and agriculture. It is expected that ground cover will be restored within ten years after planting.

23. The cost of reclamation is between 2.2 and 2.5 million rupiah per hectare (US dollars 1050 to 1200), meaning that the cost of rehabilitating the land mined in a year is about 40 000 dollars. So far, of the 500 hectares mined, 200 have been rehabilitated. At present, rehabilitation proceeds at a rate slightly higher than that of mining, in order to make possible the rehabilitation of previously mined, non-rehabilitated areas. The reclamation programme has been under-way for several years, but was intensified in 1991, partly as a result of the environmental review process.

24. The bauxite is washed on site using sea water. Tailings are sent to tailings ponds, where the tailings, consisting mainly of soil and fine fractions of bauxite, settle and the water floats back to the sea through the overflow. Since the water is not treated further, and since the fine fractions do not always settle completely, some tailings are released to the sea. There are two tailings ponds in the western part of the island with an area of 29 and 12 (to be expanded to 24) hectares respectively. The final thickness of the tailings is three meters. Revegetation of tailings ponds is done in the same way as for mined out areas, except that the ground is not plown before planting.

25. Dust problems are mainly confined to the mining areas themselves, since the bauxite is wet after washing. Spraying with sea water is carried out when needed in the mining areas. Loading of ships in the port is done using a conveyor with water to minimize dust.

26. No effects on marine life have been identified from the release of water from the washing process or from the mining in shallow water. Considering the fact that rainfall, and consequently runoff, is high, and that the areas where water is released or where mining is carried out are all directly connected with the sea, effects would be expected to be limited to the sea bottom, where material may settle. However, no systematic investigation has been made.

27. In summary, while examples of more ambitious rehabilitation programmes exist in the international bauxite industry, for instance in Western Australia, very significant progress in this regard has been made at Aneka Tambang's operation on Bintan Island. Compared to most bauxite mines, in particular in developing countries, the mine has limited negative impact on the environment.

1.2 Socio-economic impacts

28. Bintan Island has a population of about 50 000 and is densely populated. The closeness to Singapore is obviously of great importance to the local economy, and Bintan Island forms part of the "Growth Triangle" consisting of Singapore, the state of

Johore in Malaysia and Riau province in Indonesia. Local fishing and agriculture depends on the Singaporean market, and tourism, in particular from Singapore, is expanding rapidly. The price of land has increased as a result of plans for establishment of new industries, and there are signs of potential conflicts between mining and other land uses. A planned industrial zone overlaps with one of the mining concessions, and another part of the concession will become a catchment area for water that will be piped to Singapore. The mining company hopes that it will be allowed to mine certain pieces of land before they are taken for other purposes.

29. The company has built a village of 290 houses, housing some of its employees. A primary school, sports facilities and a hospital with 46 beds and three doctors are located in the village.

30. Income levels for mine employees are somewhat higher than the average on the island, where incomes are higher than the national average.

31. In summary, the socio-economic impact of the bauxite mining on Bintan Island has been limited, but conflicts with other land uses are likely to become more important in the future.

2. Aluminium production

32. Among impacts on the natural and physical environment, the main environmental problem in aluminium smelting is air pollution caused by fluorides emitted from the aluminium reduction cell. The fluorides come from the molten cryolite used as a bath for the electrolysis and as a result, the fumes emitted from the electrolytic cell contain gaseous fluorides (mainly hydrogen fluoride) and particulate fluorides. Gaseous fluorides from the recycling of anode butts are also contained in the exhaust gas of the anode baking furnace. Excessive intake of fluoride can cause fluorosis (skeletal disorders) in humans. No such cases have been reported for workers in modern aluminium smelters or for inhabitants around smelters. Farm animals can be affected by fluorosis by ingestion of fluoride in contaminated forage. Vegetation is variably susceptible to fluoride. Some species may be injured at low concentrations. Other, less important emissions to the atmosphere from aluminium smelting include coal tar pitch volatiles from cell cathode relining, carbon, alumina and fluoride dusts arising at various stages of the production process, sulphur dioxide from electrolytic cells when petroleum coke containing sulphur is used for anodes and from anode baking, and nitrogen oxides from anode baking furnaces and cast-house furnaces.

33. Emissions to water of fluorides and suspended solids of alumina and carbon may result from wet scrubbing of fumes from electrolytic cells. Fluorides and cyanide may be leached from spent cell linings if these are stored inadequately.

34. The major solid waste problem relates to spent cell linings, which contain fluorides, sodium and small amounts of carbides, nitrides and cyanides. Skimmings

and drosses from cast-houses can generate dust or, if wetted, gases, including ammonia[3].

2.1 Impacts on the physical and natural environment

35. The smelter at Kuala Tanjung is located on flat land on a drained coastal swamp. Sand was pumped from the sea to raise the level of the land by four meters. The climate is tropical with about 1500 millimeters of rainfall per year, most of which falls in the period September to December. The rest of the year is relatively dry. The coast was almost deserted before the smelter was constructed, and is still sparsely populated, with fishing, small scale animal husbandry, gardening and rice farming being the main activities. Farther inland are large palm oil and rubber plantations.

36. As already mentioned, the smelter was constructed using Japanese technology, including environmental control, and a large portion of the staff underwent training in Japan. The master agreement concluded between the Indonesian government and the Nippon Asahan Aluminium consortium sets certain standards as regards emissions, since at the time of construction there was no specific environmental legislation in Indonesia. Emission standards for aluminium smelting have still not been defined by regulation, probably because the Inalum smelter is the only operation of its kind in the country and it is considered to be sufficiently regulated through the master agreement. There are no inspections from government authorities, but the company submits reports on environmental management to the government every three months.

37. A baseline environmental study was carried out before construction started. Continuous monitoring of fluoride levels in air, soil, ground water, surface water, rain water, sea water, vegetation and animals (specially kept for this purpose) is carried out at different distances from the smelter. The monitoring programme has detected no raised levels of fluoride.

38. The smelter uses a dry scrubbing system with bag filters to clean fumes from the electrolysis. Alumina and fluoride are recycled. Gaseous fluoride combines with alumina under pressure in the recyclers to form aluminium fluoride which is returned to the cells. Virtually all particulate fluoride and 97 per cent of the hydrogen fluoride is recovered in the dry scrubbers. The exhaust gases from the anode baking furnace are cleaned using electrostatic precipitation. The used anode butts are broken, and the carbon is separated from alumina and fluorides using a sieve.

39. The smelter operates with self-imposed emission standards that are somewhat more stringent than the ones set in the master agreement. Table 2 shows these standards as well as emissions during the first six months of 1993. Current emission standards for fluoride in aluminium producing countries are generally between 0.5 and 1.25 kilograms per ton aluminium produced[4]. Actual emissions at Inalum are well below the industry average and compare favourably with the emissions achieved in the most recently constructed smelters. Sulphur emissions are below the detectable level, since the sulphur content in the petroleum coke used for anodes is very low.

40. As regards solid waste, spent potliner is put in a ditch lined with clay to ensure impermeability. The company is considering the introduction of a system for treatment of spent potliner. Relining of the pots is carried out by a sub-contractor, and does not form part of Inalum's operations. Dross from the casting-house is skimmed off and sold. The dross is stored under roof. At the port, unloading of alumina is carried out using a suction loader. The alumina is transported to the smelter in closed conveyors to avoid spillage.

Table 2 Fluoride emissions, Inalum smelter

	Gaseous fluoride, kg/ton aluminium		Particles, gram/cubic meter	
Master agreement	1.2		0.2	
Self-imposed standard	1.0		0.16	
Results first six months 1993	1st quarter	2nd quarter	1st quarter	2nd quarter
From reduction process	0.168	0.343	0.001	0.001
From anode baking	0.050	0.070	0.060	0.028
Total	0.218	0.413	0.061	0.029

Source: Inalum

41. Process water is recirculated, and no leaks to the groundwater from the spent potliner have been detected.

42. Workers' health and safety appear to be adequately handled. Employees are given twice yearly medical checkups. The maximum permitted noise level in the potroom is 80 dB. From the absence of visible fumes in the potroom, it can be concluded that collection systems for exhaust gases are adequately operated, thus posing little or no hazard to workers' health.

43. As already mentioned (see chapter II), the smelter has had problems reaching full capacity because of a shortage of power resulting from the uneven water level of Lake Toba. While the variations in the water level may result from leakage through cracks in the lake bed (the region is tectonically active), they are considered more likely to be due to illegal logging on the mountains surrounding the lake which has reduced the buffering capacity of the mountainsides, rainfall being highly variable.

44. In summary, negative impacts on the environment have been successfully minimized at Inalum's smelter, and it would probably be appropriate to rank it among the best internationally in environmental practices.

2.2 Socio-economic impacts

45. The company has built a townsite with 1340 houses 16 kilometers from the smelter. The townsite includes a school, a hospital and sports facilities. Electricity and water are supplied by the company, which also handles sewage. The population of the immediate surrounding region is estimated at between 7000 and 8000.

46. Income levels at Inalum are above the regional average. In addition to the increased income, the establishment of the smelter has resulted in some stimulus to the local economy through increased demand for locally produced food. As far as can be determined, the smelter has not displaced or affected negatively any other economic activities.

47. The company's school and medical facilities are open also to non-employees in the surrounding area. In general, the health of employees is considerably better than that of other inhabitants of the region, as a result of better housing and regular medical checkups. Respiratory diseases are common in the area, due to the low quality of dwellings. Dengue fever is relatively common, although there are no cases among Inalum employees.

IV. DESCRIPTION OF GOVERNMENT POLICIES

1. General economic policies

48. Over the past decade, the Indonesian economy has gone through a major restructuring process. This process, which was made necessary by the fall in oil export revenues, has reduced the dependence on oil exports drastically and has resulted in a rapid diversification of the economy. An important ingredient in the restructuring process has been regulatory reforms, including deregulation of financial markets, of investment decisions and of foreign trade.

49. In the early 1980s, industrial production in Indonesia was held back by a multitude of regulations and procedures. Both foreign and domestic entrepreneurs had to contend with a complex regulatory environment which, together with a protective import regime inhibited competition and flexibility, encouraged rent seeking and slowed down productivity improvements. The main elements of the regulatory framework were a restrictive investment and capacity licensing system, extensive regulations of foreign investment, rigid land and labour laws and regulations. Foreign exchange controls, however, were lifted in 1970/71. Starting in 1985, a number of measures were taken by the government in order to simplify the investment approval process and relax controls. Also during the second half of the 1980s, the government implemented a series of trade deregulation packages. The primary objective of these trade reform measures was to move away from a trade regime based on license protection towards one based on tariffs.

50. The economic reform process is likely to have had significant indirect effects on environmental management. While these are difficult to identify exactly and to quantify, it is likely that the greater freedom accorded to enterprises in matters such as choice of suppliers and location, use of imported technology etc. has been of at least potential benefit to environmental management. On the other hand, the earlier detailed licensing procedure provided ample opportunity for environmental authorities to intervene. The abolition of this procedure means that the environmental authorities have had to institute their own procedures and strengthen their organizational infrastructure.

2. Environmental and mining legislation and institutions

2.1 Legislation

51. Environmental legislation in Indonesia has been significantly strengthened in recent years, partly because of increased awareness of environmental problems among the general Indonesian public, but also as a result of widespread international criticism of environmental practices in the country, in particular as regards exploitation of tropical forests.

52. Article 33 of the 1945 Constitution of the Republic of Indonesia states: "The state shall administer the national resources yielded in the land, water and air and

shall utilize them for the people's welfare; and shall administer the means of production which are vital to and influence the life of a majority of the people."

53. The main enabling law for the constitution's environmental requirement is **Act No. 4 of 1982**. This act serves as a basis for all legislation containing provisions related to aspects of the living environment. Defined under the act are:

* The right of every individual to have a good and healthy environment and the obligation of every individual to maintain and protect the environment;
* The "polluter pays" principle;
* The requirement for analyses of any environmental impact for every planned project that is considered likely to have a significant effect on the environment;
* The authorization of a system of incentives, disincentives and licensing requirements to promote environmental management; and
* Compensation for victims of environmental damage and pollution, and restoration of the environment.

54. Existing legislation relies exclusively on administrative enforcement of regulations. The introduction of economic incentives is however being considered and may be introduced in the future. In this connexion, it should be mentioned that environmental control costs are considered to be part of operating costs and are therefore deductible for tax purposes.

55. Detailed regulations of the Act No. 4 of 1982 are contained in **Government Regulation 29 of 1986**. Regulation 29 prescribes an environmental impact assessment process. This is supported by a ministerial decree containing general guidelines for implementation and procedures for the establishment of environmental impact assessment review commissions in sectoral departments and provincial governments responsible for implementing the regulation.

56. The regulatory instrument used depends on the activity proposed. A presentation of environmental information (PIL) is required for less extensive projects. It is intended to explain the project design and its likely environmental consequences and to present plans to remedy any negative environmental impact. For large or complex projects, an environmental impact analysis (AMDAL) is required.

57. Other related regulations of importance to mining and metal industries are:

Government Regulation No. 20 of 1990. Under this law liquid waste can only be discharged into water with the permission of the governor of the affected region; and standards for constituents of effluents can be established by the Minister or, in some cases, the governor concerned.

The **State Minister of Population and Environment No. KEP-03/MENKLH/1991** provides for liquid waste quality standards for activities already in operation.

58. Laws pertaining to conservation of nature and natural resources are embodied in **Act 5 of 1967** - Basic Law on Forestry, and the Nature Protection Ordinance. In addition, a large number of national regulations address pollution control, and extensive regulations concerning air, water and effluent quality and hazardous waste pollution control measures have been issued at the provincial level. The regulations generally use performance rather than process standards, and are based on spatial rather than sectoral considerations. Provincial governments are meant to play a prominent role in the establishment of standards, based on their understanding of the absorption capacity of the areas under their jurisdiction. Obviously, the competence of provincial governments in this respect varies.

59. There are several pieces of legislation that regulate the operations and environmental aspects of various sectors of the Indonesian mining industry.

60. **Law No. 11 of 1967** (Basic Provision on Mining) encourages foreign investment in development of the country's mineral resources by permitting the Ministry of Mines and Energy to enter into "contracts of work" (COW) with foreign companies.

61. Under this law, development of minerals classified as strategic (oil and gas, tin, nickel, radioactive minerals, cobalt and coal) is not permitted except through the state-owned mining companies or the government agencies especially assigned by the Minister of Mines and Energy. The government can however contract foreign companies to develop strategic mineral deposits. Development of vital minerals (gold, silver, lead, zinc, iron, manganese, molybdenum, chromite, tungsten, copper, platinum, diamonds, fluorspar, bauxite, sulphur and various other metallic minerals) and other minerals (such as clay and building materials) may be carried out by the private sector and cooperatives.

62. The COW is a detailed legal document that substitutes for regulations and requirements in many instances. It is approved by the parliament. In general a COW spells out the contractor's right to search and explore for minerals in the contract area, to develop and mine any mineral deposit found in the mining area, to process, refine, store, transport, market sell or dispose of all the product inside and outside of Indonesia. It also spells out the environmental obligations of the contractor. The mandatory feasibility study has to include an environmental impact study into the effects of the operation of the mine on the environment and outline measures the company intends to use to mitigate adverse impact. (See Annex 1 for environmental requirements attached to a typical COW). A COW may only be transferred or assigned with the prior consent of the government. The government does not attempt systematically to screen applicants for COWs with regard to their past environmental performance.

63. Plans for rehabilitation are included in a COW and rehabilitation has to be carried out on a continuing basis. COWs do not, however, contain any provisions regarding the establishment of a rehabilitation fund.

64. All other mining authorizations (ordinary mining licenses) outside of the scope of COWs are covered by mandatory environmental measures based on the following provisions of law:

* **Article 30 of the Mining Law of 1967** states that "After completion of mining for minerals in any mine, the holder of the relevant mining authorization is obliged to restore the land in such condition so as to not to evoke any danger of disease or any other hazards to the people living in the surrounding of the mine". The law does not prescribe any particular procedures to be followed as regards the financing of rehabilitation.
* **Regulation No. 4 of 1974** is on the management of activities and measures to prevent any adverse effects and pollution due to mining activities;
* **Presidential Decree No. 1 of 1976** regulates mining activities with regard to agrarian affairs, forestry, transmigration and public works; and
* **Article 16 of Act No. 4 of 1982** states that "For any plan which could be expected to create an important impact to the environment, an Environmental Impact Analysis (EIA) should be carried out, the implementation of which is guided by Government Regulations."
* **Article 6(1) and (2) of Regulation 29** state that the EIA is a part of the feasibility study and that costs of environmental management are part of the normal project costs.

65. Sanctions against operators that do not conform to the conditions on which approval has been given include fines, prison and suspension of mining permit. So far, conditions laid down have been followed and no actin has had to be taken.

66. The Mining Law of 1967 is in the process of being revised and proposals are being prepared. One of the changes being considered is to integrate environmental provisions in the mining law.

2.2 Institutional Framework

67. Environmental matters were previously under the overall management and coordination of the State Ministry of Population and Environment. As of the VIth Development Plan, beginning in 1993, the Ministry of Environment was established, illustrating the increased importance of environmental matters. Significant responsibilities are, however, widely distributed among a variety of departments and agencies of the government, including the Department of Mines and Energy for non-renewable resources, including offshore mining, energy and electricity.

68. BAPEDAL is a new environmental impact control agency created primarily to ensure enforcement of environmental regulations. It reports directly to the President. The creation of BAPEDAL is one indication of the government's efforts to address inadequacy in the sectoral enforcement of environmental regulations. This agency drafts standards in cooperation with other government agencies and carries out on site inspections. It relies heavily on non-governmental organizations to get reports about breaches of regulations.

69. The Department of Mines and Energy (DME) has authority over mining sector. It has established a Central Commission for Environment and a Technical Commission for Environment to attend to the required presentation of environmental assessment reports. Approval of environmental impact analyses, management and monitoring plans is under the Central Commission for Environment with the assistance of the Technical Commission.

70. Matters related to the downstream processing of mineral products falls under the administration of the Ministry of Industry. Primary smelters are handled by the Directorate General for Metal Based Machinery and Electronics while metal manufacturing and recycling is under the Directorate General of Small Industry.

71. There are no specific procedures for obtaining the views of local communities on proposed activities that could influence the environment, it being assumed that local and provincial government authorities will automatically notify the central authorities of any local objections.

2.3 Environmental impact assessment legislation and practice

72. Article 16 of the Act No. 4 of 1982 states: "Every plan which is considered likely to have a significant impact on the environment must be accompanied with an analysis of environmental impact, carried out according to government regulations".

73. The administrative regulations stipulate that the analysis of environmental impact must indicate precisely the negative and positive impacts of a particular activity so that steps may be prepared as early as possible in order to abate its negative impact and develop its positive impact. The major impacts to be considered are:

1. The total number of people affected;
2. The size of the area affected;
3. The length of time during which the impacts will persist;
4. The intensity of the impact;
5. The number of other environment components affected;
6. The cumulative nature of impact; and
7. Reversible or irreversible impact.

74. A proponent of a mining project, irrespective of the type of mining license, is required to submit several EIA documents, including proposals for rehabilitation and monitoring procedures. Negotiations for Terms of Reference with the proponent is conducted on the basis of the detailed regulations and standards. To ensure unbiased and high quality EIA reports, baseline measurements are carried out by independent consultants paid by the proponent. Local interests are represented by local (provincial and district) governments. Approval of EIAs is discussed in the Central Commission for Environmental Impact Analysis where the Ministry of Environment is represented. Since the implementation of EIA regulations and until the end of June 1993, 141 EIAs on mining projects had been approved. Proponents are required to monitor their own activities and report regularly to the appropriate government agency for review. The

relevant government authorities carry out inspections in response to reports from local governments, public reaction etc. BAPEDAL can however carry out surprise inspections and take samples even in the absence of the operator. The EIA process is summarized in Annex 2.

V. ASSESSMENT OF POLICIES AND ENVIRONMENTAL PRACTICES

75. The bauxite/aluminium industry in Indonesia is too limited in size and too specialized in terms of its environmental effects for a general assessment of policies and environmental practices to be based on conditions in this industry. Results of the present case study will be compared with studies on bauxite, alumina and aluminium production in two other countries (Brazil and Jamaica) in order to evaluate how environmental and other policies affect the environmental performance of the bauxite/alumina/aluminium industry. In this context, significant differences between countries if any will also be identified. Some limited conclusions can however be attempted already on the basis of the present study.

76. Environmental policies as established by legislation appear to have had very limited effect on aluminium production in Indonesia. The only aluminium smelter was designed and started at a time when detailed environmental legislation was largely non-existent in the country, technologies and environmental targets were transposed from experience in another country (Japan), and subsequent regulatory changes have had no discernible effect on environmental management practices. The main reason for the absence of any effect of regulatory changes is of course that the operation satisfies any requirements that could reasonably be formulated by the responsible authorities. Had the practices been less in line with good industry standards, regulatory changes might or might not have led to improvements. The changes that have occurred in the composition of the ownership of the smelter, with the Indonesian government acquiring a larger share, have not, as far as can be determined, affected environmental performance or management. Neither have the dramatic downturn in aluminium prices over the past few years, which must have resulted in significant changes in profitability, or the failure of the smelter to achieve a 100 per cent operating rate.

77. It is interesting to note that the failure of the smelter to reach full capacity utilization appears to be directly attributable to a failure of environmental regulation in another area, that of forestry management. If the forests on the mountain slopes surrounding Lake Toba had not been illegally logged, the water level in the lake might have been more stable and it might have been possible to utilize the full generating capacity of the power stations. The problem illustrates the difficulty of ensuring compliance with environmental regulations in Indonesia. It also provides a demonstration of the direct economic effects of non-compliance - in addition to the loss of environmental values, which in the case of Lake Toba, which is a natural reserve, are considerable.

78. Bauxite mining appears to have been more directly affected by the process of strengthening of environmental requirements and regulations. Although rehabilitation of mined out areas had been initiated before regulations were strengthened and before

the environment management plan was reviewed and approved, it is probably significant that rehabilitation was speeded up and procedures improved following the approval of the plan. Evidence of the improvement in procedures is seen from the considerably better results achieved in areas that have been replanted in recent years compared to those that were replanted in the 1980s.

79. Compared to conditions in other industry sectors in Indonesia, environmental practices in the bauxite/aluminium industry, and indeed, in mining and metals production in general, appear not to pose any major problems, and government monitoring and enforcement of environmental regulations are judged to be effective in this industry. This does not mean that environmental problems are completely absent, or that they will not materialize in the future. Government officials responsible for monitoring and enforcement agree that neither financial nor human resources would be sufficient at present to ensure by themselves a good environmental performance. The Department of Mines and Energy has requested that half of the central government's share of royalty and land rent income (20 per cent of the total, with the rest going to provincial governments) be earmarked for monitoring and enforcement costs.

80. The relative absence of environmental problems in this industry in Indonesia may be attributed to its dominance by large foreign enterprises which are applying technologies and management systems developed in their home countries, where stringent regulations have been in force for a longer time. The Inalum smelter is an example of this. As the availability of private domestic investment capital improves, it may be expected that more domestic companies will enter into mining. Unless the access of these companies to appropriate technology is assured and the regulatory infrastructure is strengthened, this process may lead to mining and metallurgy becoming a more important source of environmental problems. This is already seen from the large problems arising from mining of non-metallic minerals, because the provincial governments, who are responsible for monitoring and enforcement of regulations concerning exploitation of these minerals, lack the necessary expertise and resources to be effective.

81. A general problem with the present environmental regulation process appears to be that it is oriented towards fulfilling legal and formal requirements - which it does very well - while it often lacks clarity on substantive matters. The substantive and technical requirements are thus often stated in very general terms and leave a great deal to the discretion of regulators. There have, however, also been examples of the opposite approach, where regulations have been set out in unnecessary detail. In both cases, the difficulty of finding the right level of detail appears to reflect that the system has been in force only for a relatively short period of time and that experience of its functioning is still being acquired.

82. As mentioned in chapter IV above, the present environmental legislation is based on administrative enforcement, but the introduction of economic instruments is being considered. The scope for such instruments in the mining and metals industry is however likely to be limited, given the heterogeneous nature of the industry and the small number of operations, which would seem to rule out market based instruments.

As regards rehabilitation, however, the use of economic incentives, specifically the mandatory establishment of rehabilitation funds, may be possible and would be likely to result in some improvement of the present situation.

ANNNEXES

Annex 1

ENVIRONMENTAL REQUIREMENT ATTACHED TO A TYPICAL CONTRACT OF WORK

* The company shall include in the feasibility study of each mining operation an environmental impact study to analyse the potential impact of its operations on land, water, air, biological resources and human settlements. The environmental study will also outline measures that the company intends to use to mitigate adverse impact.

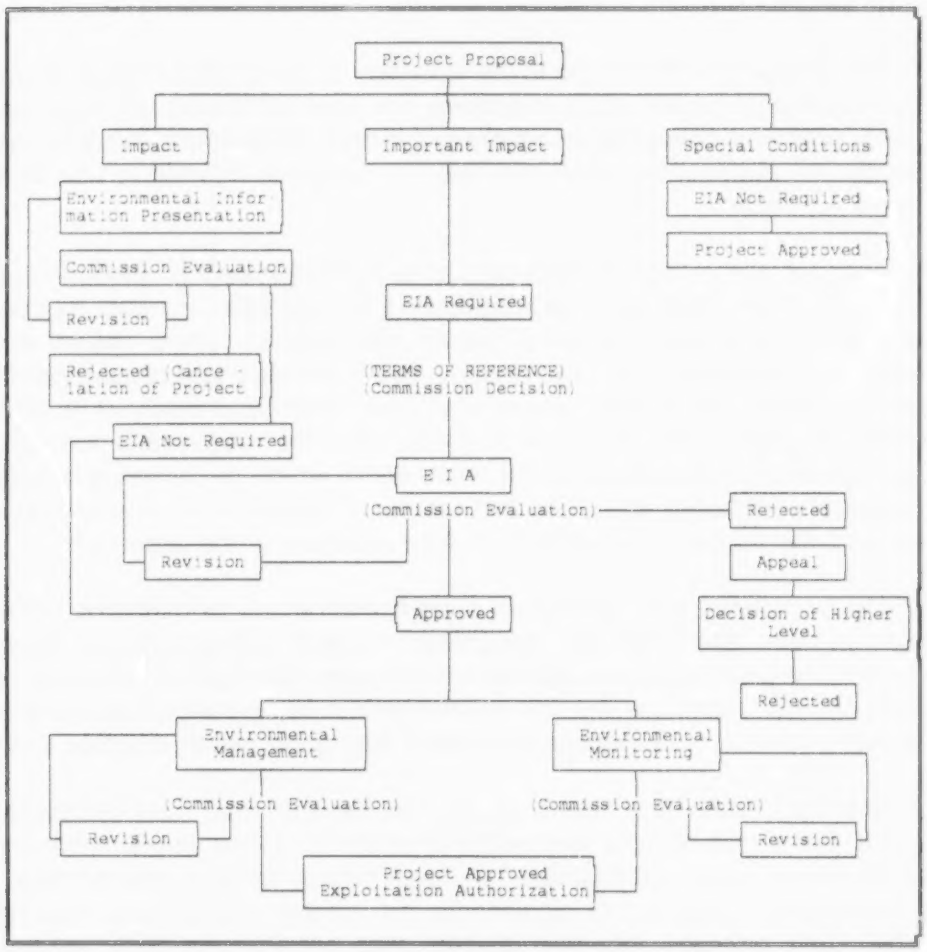
* The company shall, in accordance with the prevailing environmental and natural preservation laws and regulations of Indonesia, conduct its operations so as to control waste or loss of natural resources, to protect natural resources against unnecessary damage and to prevent pollution and contamination of the environment, and in general to maintain the health and safety of its employees and the local community. The company shall be responsible for reasonable preservation of the natural environment within which the company operates and especially for taking no actions that may unnecessarily and unreasonably block or limit the further development of the resources of the area.

* The company must operate in such a manner as to minimize harm to the environment and shall use recognized modern mining industry practices to protect natural resources against unnecessary damage, to minimize pollution and harmful emissions into the environment in its operations and to dispose of waste materials in a manner consistent with good waste disposal practices.

Under the Terms of a typical COW, the Minister may take exception to the contractor's plans and designs and withhold approval if their implementation would "disproportionately" and "unreasonably" damage the surrounding environment, limit its further development potential or significantly disrupt the sociopolitical stability in the area. The COW provides that the Minister shall not unreasonably withhold such approval. An arbitration clause of general application is a part of most COW's and could be invoked should the contractor and the Minister not be able to resolve their differences.

Annex 2

APPROVAL PROCESS FOR AN ENVIRONMENTAL IMPACT ANALYSIS



Annex 3

List of persons interviewed, 23 August to 4 September, 1993

Department of Trade
Mr. Bakir Hasan, Secretary-General
Mr. Taufiek Abbas, Secretary of Directorate General for Foreign Trade
Mr. Hans-Joachim Glasmeier, Team Leader, Indonesian-German Government Cooperation, Advisory Assistance to the Ministry of Trade

Department of Mines and Energy
Mr. Ridwan Mahmud, Environment Advisor to the Minister
Mr Kosim Gandataruna, Director General of Mines
Dr. Thamrin Sihite, Head, Division of Environmental Management and Spatial Zoning

Department of Environment
Dr. R.E. Soeriaatmadja, Assistant Minister of State

Department of Industry
Mr. Achmad Mahsyus, Inspector, Metals Industry Directorate

BAPEDAL (Environmental Impact Management Agency)
Mr. Harro Salim, Head, Sub-Directorate of Coastal Pollution Control

BKPM (Investment Control Board)
Mr. Asril Noer, Director of Overseas Promotion

P.T. Indonesia Asahan Aluminium
Mr. Motoji Minamiura, President Director
Mr. A. Tarigan Sibero, director, smelting plant
Mr. Syahrani Syukur, General Manager, Production Division, Kuala Tanjung, and colleagues

P.T. Aneka Tambang
Mr. Oloan P. Siahaan, Vice President
Mr. Amsaruddin Rasad, Vice President
Mr. Antonius Soedjarwadi, Director, Environment
Mr. Amran Abdullah, Unit Chief, Kijang, and colleagues

Association of Indonesian Mining Professionals
Mr. Priyo P. Soemarno, General Secretary
Mr. Rachman Wiriosudarmo, consultant

Indonesian Mining Association
Mr. Widartoyo, Executive Secretary

1. Unless otherwise indicated, information in this chapter has been supplied by the companies concerned.

1. Unless otherwise indicated, information in this chapter has been supplied by the companies concerned.

2. International Bauxite Association Quarterly Review: October-December 1986.

3. Metals Week, New York, 22 June 1987.

4. Japan Metal Bulletin, Tokyo, 15 December 1988.

5. Unless otherwise indicated, information in this chapter was provided by the companies concerned.

6. For a more detailed description of potential impacts and guidelines on their abatement, see United Nations Environment Programme: Guidelines for the Environmental Management of Alumina Production. UNEP 1984.

7. For a detailed description of environmental impacts of aluminium smelting and guidelines on environmental management, see United Nations Environment Programme: Guidelines for Environmental Management of Aluminium Smelters. UNEP. 1986.

8. In the United States, EPA standards are 1 kg/ton aluminium (30 day average). In Sweden, the standards are 1 kg/ton for Söderberg cells and 0.5 kg/ton for prebaked anode cells (United Nations Industrial development Organization: Pollution Prevention and Abatement Guidelines for the Aluminium Industry, Draft, January 1993). In the state of Rio de Janeiro in Brazil, standards are 1.25 kg/ton (Setepla: Case study on aluminium sector in Brazil. Report prepared for UNCTAD, September 1993, to be published).